Mem. Natn. Sci. Mus., Tokyo, (18), December 1, 1985

The Group of *Trechiama oni* (Coleoptera, Trechinae)

—— Its Distribution and Differentiation ——

By

Shun-Ichi UÉNO*

上野俊一*: オニメクラチビゴミムシ群——その分布と分化

Introduction

The group of *Trechiama oni* is an assemblage of medium-sized anophthalmic trechine beetles distributed to the eastern half of the Chûgoku Hills in western Honshu, the Izumi Hills at the western part of the Kii Peninsula, the Island of Awaji-shima, and the northeastern part of the Island of Shikoku. It is considered to have been derived from the ancestral stock of the group of *T. ohshimai* by losing one of the two dorsal series of setiferous pores on elytra (cf. UÉNO, 1959, pp. 29–30; 1975, p. 210; 1980, pp. 199, 268; 1981 b, p. 13; 1983 a, p. 76), and this view has been verified by the discoveries of such aberrant species as *T. murakamii* and *T. instabilis* that are intermediate between the two species-groups so far as concerned with the elytral chaetotaxy (cf. UÉNO, 1981 b, pp. 12–15; 1984, pp. 6–9). On the other hand, the boundaries between the group of *T. oni* and that of *T. habei* become more and more ambiguous, which has led me to the suppression of *Pseudotrechiama* originally erected for *T. habei* (cf. UÉNO, 1979, p. 120; 1981 c, p. 119).

The first two species of this group were brought to light in 1955. They were originally described as members of *Pseudotrechiama* with some reservation, but were later transferred to *Trechiama* (s. str.) when a third species was made known (UÉNO, 1959). At that time, I was still a beginner in the study of trechine beetles, and my 1955 observation of the genital slides of both *T. oni* and *T. kosugei* was insufficient with regard to certain critical points. Unfortunately, I have been unable to make detailed re-examination of these critical features until recently, since both the species are so rare that no additional males have long been available for my study.

For the past twelve years, our knowledge about the group of *T. oni* has become much enriched with the rapid progress of collecting techniques for upper hypogean species in non-calcareous areas. Seventeen species have already been described, and other six now await descriptions. Though still other new species will doubtless be found in future, especially in the areas at the northern and western parts of its distributional range, I am going to enumerate all the twenty-three species hitherto known in the present paper. They will

---

* Department of Zoology, National Science Museum, Tokyo
国立科学博物館 動物研究部

be classified into six complexes, whose distributional pattern and interrelationship will be discussed in some detail. The male genitalia of the two 1955 species will be fully redescribed on the basis of newly obtained specimens, and a key to all the species will be proposed.

The abbreviations employed in this paper are as follows: HW – greatest width of head; PW – greatest width of pronotum; PL – length of pronotum, measured along the mid-line; PA – width of pronotal apex; PB – width of pronotal base; EW – greatest width of elytra; EL – greatest length of elytra; M – arithmetic mean; NSMT – Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

I wish herewith to express my deep indebtedness to Professor Yoshiaki NISHIKAWA of Ohtemon-Gakuin University, Osaka, whose enthusiastic investigations in the field enabled me to complete the present paper. Hearty thanks are also due to the following friends of mine, who either supported my field studies or supplied me with invaluable material: the late Mr. Isamu HIURA, Messrs. Hiroshi ISHIDA, Kôjirô KATSURA, Kazuo MORI, Seiji MORITA, Kanji MUTÔ, Akira NOTO, Yuzo TARUMI, Shigeru WAKANO, and many other persons whose names were already given in my previous papers dealing with the members of the group of *Trechiama oni.*

Group of *Trechiama oni*

Similar to the group of *T. ohshimai* in most of the basic features, except that the chaetotaxy is in a more advanced state. In 9 out of the 23 species known, the pronotum is lacking in the posterior pair of marginal setae, while these are almost always present in the group of *T. ohshimai.* The elytra are usually devoid of setiferous dorsal pores on the third stria. Exceptions are *T. murakamii, T. instabilis* and *T. insolitus*; in the first two, the anterior pore exists on the third stria in all (*T. murakamii*) or about a half of (*T. instabilis*) the individuals, though the posterior one is always absent; in *T. insolitus,* three, exceptionally four, setiferous dorsal pores exist on the third stria, but none on the fifth. The pronotum is either cordate or subcordate, never subquadrate. As in the group of *T. ohshimai*, the male genitalia vary in both size and shape, and are very useful for classifying species and lineages. The inner armature is also variable; a copulatory piece is present in about a half of the known species, and is on the way of formation in some others.

Range. Distributed to western Honshu, the Island of Awaji-shima and the northeastern part of Shikoku in West Japan. In western Honshu, many species occur on the eastern half of the Chûgoku Hills, from the western part of the Tanba Highlands in the east to the Taishaku-kyô Valley in the west, and one on the Izumi Hills at the western part of the Kii Peninsula. In the Island of Shikoku, three species have been known at the northern side of the Yoshino-gawa Valley, mostly in Kagawa Prefecture, and two in the Dôzan-gawa drainage area at the easternmost part of Ehimé Prefecture.

Notes. As was mentioned in the introduction of this paper, there is no definite gap between this species-group and the group of *T. habei.* Both may have been derived from the ancestral stock of the group of *T. ohshimai*, whose members flourish at present in the areas surrounding Lake Biwa-ko. The former spread westwards onto the Chûgoku Hills and northeastern Shikoku, while the latter narrowly stretched eastwards along the Pacific coast of central Honshu and dispersed into the southern half of the Tôhoku District (cf. UÉNO, 1981 c, pp. 129–130; 1983 d). I still regard the two groups as distinctive lineages mainly because of this difference in the mode of dispersal. Their regressive evolution and morphological modification must have taken place parallel to each other, though the modification is often more intensive in the group of *T. habei*. The parallelism is sometimes found even in certain minor peculiarities, for instance, in the analogous modification of aedeagal apex between *T. fujitai* of the former group and *T. apicedentatus* S. UÉNO (1979, p. 119, figs. 2–3) of the latter.

The most strange species within the species-group is *T. insolitus* occurring in several limestone caves of the Taishaku area. Only in this isolated species, the loss of setiferous dorsal pores on elytra has taken place on the fifth stria, not on the third. Because of this peculiarity, JEANNEL (1962, pp. 195, 196) erected *Hemitrechiama* for receiving it. The species is also remarkable in bearing usually a few vestigial pubescence at the apical portion of the anterior face of its protibiae. However, I prefer to regard it as a peculiar offshoot of the group of *T. oni*, since it shares all the other diagnostic characters with the other members of the species-group.

The trechine beetles belonging to the group of *T. oni* are mostly upper hypogean inhabitants. Thirteen out of the 23 species known have been found in the upper hypogean zone, and 3 of them have also been collected in mine adits. Some may occur in the endogean zone or even in shallower places, under dead leaves along shaded streams for instance, but their ordinary habitats seem to be in the upper hypogean zone. Seven species have so far been known only from mine adits and three others only from natural caves. I believe, however, that all of them will be found some day in colluvia accumulated along mountain streams.

Like those of the group of *T. ohshimai*, the members of the group of *T. oni* are often very closely similar to one another in their facies. They can be identified with confidence only by the characteristics of their male genitalia. Accordingly, the key to the species given on the following lines is largely based on these characteristics alone.

Key to the Species

1 (46) Elytral stria 5 with two setiferous dorsal pores.
2 (5) Elytral stria 3 with a setiferous dorsal pore near base.
3 (4) Pronotum narrower at apex and with shorter basal part; elytra narrower, with clearly marked shoulders; aedeagal inner sac with much smaller teeth-patch at the left side; copulatory piece with sharply hooked right lobe; smaller species; length 4.65–5.85 mm. . . . . *T. murakamii* S. UÉNO.
4 (3) Pronotum wider at apex and with longer basal part; elytra wider, oval, with shoulders almost effaced; aedeagal inner sac with large recurved teeth-patch at the left side; copulatory piece saddle-shaped, without hooked right lobe; larger species; length 5.50–6.30 mm . . . . *T. instabilis* S. UÉNO [part].
5 (2) Elytral stria 3 without setiferous dorsal pore.
6 (29) Pronotum with two pair of marginal setae.
7 (16) Aedeagus with symmetrical apical orifice; apical lobe simple at the tip; northeastern

Shikoku and Is. Awaji-shima.

8 (9) Copulatory piece present .... *T. instabilis* S. Uéno [part].

9 (8) Copulatory piece absent.

10 (11) Aedeagal inner sac with a symmetrical teeth-patch near apical orifice and devoid of recurved teeth-patch at the left side; length 4.35–5.60 mm .... *T. fujiwaraorum* S. Uéno.

11 (10) Aedeagal inner sac with a large recurved teeth-patch at the left side and devoid of symmetrical teeth-patch near apical orifice.

12 (13) Aedeagus smaller and shorter, only one-fourth as long as elytra, with short broad apical lobe and very large teeth-patch at the left side of inner sac; Is. Awaji-shima; length 5.25–5.95 mm .... *T. onocoro* S. Uéno.

13 (12) Aedeagus larger and longer, about three-tenths as long as elytra, with long narrow apical lobe and relatively small teeth-patch at the left side of inner sac; northeastern Shikoku.

14 (15) Elytra wider and more convex, with shorter and shallower scutellar striole; aedeagus with shorter and broader apical lobe and shorter teeth-patch at the left side of inner sac; length 4.90–5.90 mm .... *T. satoui* S. Uéno.

15 (14) Elytra narrower and less convex, with longer and deeper scutellar striole; aedeagus with longer and narrower apical lobe and longer teeth-patch at the left side of inner sac; length 5.30–5.70 mm .... *T. tenuis* S. Uéno.

16 (7) Aedeagal apical orifice more or less asymmetrical, and/or apical lobe modified at the tip; Honshu (eastern part of the Chûgoku Hills and the Izumi Hills).

17 (20) Aedeagal apical lobe with a rounded horizontal plate at the ventral side of the tip, whose anterior margin is carinate; inner sac without left proximal patch of heavily sclerotized teeth.

18 (19) Colour lighter; prothorax more strongly contracted both at apex and at base, with more strongly arcuate sides and usually less protruding hind angles; elytra more elongate and more pointed at apices; aedeagus smaller and shorter, about two-sevenths as long as elytra, with longer apical lobe; apical orifice gently asymmetrical; copulatory piece small, less than two-ninths as long as aedeagus; length 5.50–6.05 mm .... *T. tangonis* sp. nov.

19 (18) Colour darker; prothorax less contracted at the two ends, with less strongly arcuate sides and more protruding hind angles; elytra shorter, evidently wider in ♂, and more widely rounded at apices; aedeagus larger and more elongate, about four-ninths as long as elytra, with shorter apical lobe; apical orifice distinctly asymmetrical; copulatory piece very large, more than a half as long as aedeagus; length 5.65–6.65 mm .... *T. notoi* S. Uéno.

20 (17) Aedeagal apical lobe not modified into a rounded horizontal plate at the ventral side of the tip; inner sac with a left proximal patch of heavily sclerotized teeth.

21 (22) Aedeagus only weakly asymmetrical at apical orifice, with very broad apical lobe whose tip is very briefly produced and subtruncated; length 5.10–6.00 mm .... *T. shuten* S. Uéno.

22 (21) Aedeagus strongly asymmetrical at apical orifice, with much reduced left wall.

23 (24) Prothorax narrower; aedeagal apical lobe long subtriangular, with a small, briefly pedunculate tubercle at the tip, which is curved ventrad; copulatory piece broad, with the tip directed upwards; length 5.10–5.50 mm...*T. kosugei* S. UÉNO.

24 (23) Prothorax wider; aedeagal apical lobe more or less broad to near apex, with terminal tubercle, if present, fairly large and not briefly pedunculate.

25 (28) Aedeagal apical lobe broader and more or less tuberculate at the tip; inner sac armed with larger copulatory piece and smaller left proximal teeth-patch.

26 (27) Elytra ovate, with distinct shoulders; aedeagus shorter, with shorter oblique teeth-patch at the left side of inner sac; copulatory piece narrow and flattened, with twofold proximal part; length 4.80–5.60 mm..*T. expectatus* S. UÉNO.

27 (26) Elytra oval, with almost effaced shoulders; aedeagus more elongate, with longer horizontal teeth-patch at the left side of inner sac; copulatory piece longitudinally concave on the ventral side and horizontally truncated at the apex; length 5.50–5.75 mm..*T. dissitus* S. UÉNO.

28 (25) Aedeagal apical lobe narrower and subtruncated at the tip; inner sac armed with smaller copulatory piece and larger left proximal teeth-patch; length 5.00–6.15 mm ....*T. yoshiakii* S. UÉNO.

29 (6) Pronotum with only a pair of marginal setae, postangular pair absent.

30 (31) Aedeagus very short, only one-fourth as long as elytra, and strongly asymmetrical at apical orifice; apical lobe long subtriangular, with a small, briefly pedunculate tubercle at the tip; length 4.60–5.45 mm ....*T. silicicola* S. UÉNO.

31 (30) Aedeagus more or less elongate, usually more than three-tenths as long as elytra, and symmetrical at apical orifice.

32 (45) Aedeagal apical lobe more or less broad; left proximal teeth-patch inside inner sac without dorsal arm; copulatory piece either absent or imperfect.

33 (44) Prothorax less transverse, with hind angles acute, postero-laterally projecting; elytra wider, oval, with more or less effaced shoulders.

34 (43) Left proximal teeth-patch inside aedeagal inner sac small, not elongate; apical setae on styles of ordinary length.

35 (36) Aedeagal apical lobe regularly narrowed towards subtruncated apex, which is subtriangularly dentate at the left side; prothorax strongly contracted at base; length 5.50–5.90 mm ....*T. fujitai* S. UÉNO.

36 (35) Aedeagal apical lobe either feebly narrowed towards apex or parallel-sided or roundly dilated, without subtriangular tooth at the left side.

37 (42) Aedeagal apical lobe without angulate protuberance formed by three carinae on the ventral surface.

38 (41) Aedeagal apical lobe feebly narrowed towards apex, which is lightly produced and subtruncated, not angulate on either side.

39 (40) Prothorax shorter, cordate, more strongly contracted at base than at apex; elytra

narrower, more widely rounded at apices; aedeagal apical lobe straight, smooth on the ventral surface; length 5.45–5.60 mm .... *T. moritai* sp. nov.

40 (39) Prothorax longer, more strongly contracted at apex than at base; elytra wider, more narrowly rounded at apices; aedeagal apical lobe slightly reflexed towards the blunt tip and covered on the ventral surface with numerous recurved spinules; length 5.05–6.10 mm .... *T. spinulifer* sp. nov.

41 (38) Aedeagal apical lobe parallel-sided and widely truncated at the tip, forming an obtuse angle on either side; prothorax strongly cordate; length 5.30–6.30 mm .... *T. crassilobatus* S. Uéno.

42 (37) Aedeagal apical lobe laterally expanded, tricarinate on the ventral surface, and with an angulate central protuberance formed by those carinae; head small, prothorax more strongly contracted at apex than at base; length 5.05–5.80 mm .... *T. cuspidatus* sp. nov.

43 (34) Left proximal teeth-patch inside aedeagal inner sac very large, elongate, sigmoidally folded, and forming at apex a semi-oval lamella by fusion of compact teeth; aedeagal apical lobe broad and subparallel-sided to near apex in dorsal view; apical setae on styles short; length 4.75–5.60 mm .... *T. hiurai* sp. nov.

44 (33) Prothorax more transverse, with hind angles either rectangular or only a little sharp, hardly projecting laterad; elytra narrower, oblong-ovate, with distinct shoulders; aedeagal apical lobe flattened from the base, ventrally curved, and subtriangular at the terminal portion; left proximal teeth-patch inside inner sac elongate and oblique; length 5.60–6.05 mm .... *T. yukikoae* sp. nov.

45 (32) Aedeagal apical lobe long and narrow, curved ventrad, and inclined to the left; left proximal teeth-patch inside inner sac with a long horizontal dorsal arm branching off from the dorso-proximal corner of the main part; copulatory piece present; slender species, with elongate prothorax and oblong-oval elytra; length 5.40–6.05 mm .... *T. oni* S. Uéno.

46 (1) Elytral stria 5 without setiferous dorsal pore, stria 3 with three (exceptionally four) setiferous dorsal pores; length 5.60–6.10 mm .... *T. insolitus* S. Uéno.

Trechiama (s. str.) ***murakamii*** S. Uéno, 1984

Trechiama (s. str.) *murakamii* S. Uéno, 1984, J. speleol. Soc. Japan, 9, p. 6, figs. 1–4; type locality: prospecting adit at Nakanokawa in Shingû-mura.

No additional record.

Range. Known so far only from the Gazatta-dani in Shingû-mura at the northern part of the Island of Shikoku.

Notes. This and the following species belong to the same lineage somewhat different from that of *T. satoui*. They are characterized by the presence of a copulatory piece and the existence (at least in some individuals) of a setiferous dorsal pore on the third elytral stria. Because of these peculiarities, they are considered to form a complex of their own, though their close affinity to the *satoui* complex cannot be denied, as is clearly indicated by the similarity in the shape of aedeagus and of the left proximal teeth-patch inside the inner sac.

Trechiama (s. str.) ***instabilis*** S. Uéno, 1981

Trechiama (s. str.) *instabilis* S. Uéno, 1981, J. speleol. Soc. Japan, 6, p. 12, figs. 1–3; type locality: Mt. Zôzu-san; 1985, Coleopt. Japan Col., Osaka, 2, p. 74, pl. 14, fig. 9. —— Casale & Laneyrie, 1982, Mém. Biospéol., 9, p. 87.

No additional record.

Range. Endemic to the type locality, Mt. Zôzu-san, lying at the northeastern part of the Island of Shikoku.

Trechiama (s. str.) ***fujiwaraorum*** S. Uéno, 1981

Trechiama (s. str.) *fujiwaraorum* S. Uéno, 1981, J. speleol. Soc. Japan, 6, p. 15, figs. 4–6; type locality: Shingû Mine in Shingû-mura; 1982, J. speleol. Soc. Japan, 7, p. 100; 1984, J. speleol. Soc. Japan, 9, p. 10; 1985, Coleopt. Japan Col., Osaka, 2, p. 74, pl. 14, fig. 11. —— Casale & Laneyrie, 1982, Mém. Biospéol., 9, p. 87.

No additional record.

Range. Known from four mine adits and an upper hypogean habitat in the Dôzan-gawa drainage at the northern part of the Island of Shikoku.

Notes. This species is considerably different from the other members of the *satoui* complex in the conformation of the inner armature of male genitalia, but is tentatively placed in that species-complex because of the close resemblance in external morphology.

Trechiama (s. str.) ***onocoro*** S. Uéno, 1983

Trechiama (s. str.) *onocoro* S. Uéno, 1983, Annot. zool. japon., 56, p. 355, figs. 3–4; type locality: Kabuto-yama on Is. Awaji-shima; 1985, Coleopt. Japan Col., Osaka, 2, p. 74.

No additional record.

Range. Known so far only from the type locality at the southern part of the Island of Awaji-shima.

Notes. This and the two following species are closely related to one another and form a compact complex within the group of *T. oni.*

Trechiama (s. str.) ***satoui*** S. Uéno, 1975

Trechiama (s. str.) *satoui* S. Uéno, 1975, Bull. natn. Sci. Mus., Tokyo, (A), 1, p. 204, figs. 1–3; type locality: Mt. Daisen-zan; 1983, Bull. natn. Sci. Mus., Tokyo, (A), 9, p. 74; 1985, Coleopt. Japan Col., Osaka, 2, p. 74, pl. 14, fig. 10. —— Casale & Laneyrie, 1982, Mém. Biospéol., 9, p. 87.

No additional record.

Range. Probably rather widespread at the western part of the Sanuki Hills in northeastern Shikoku, though hitherto known only from Mt. Daisen-zan and the vicinities of Mt.

Ohtaki-san. An isolated colony is known on Iwaseo-yama in Takamatsu City, where this species coexists with *T. exilis* S. UÉNO and *Stygiotrechus satoui satoui* S. UÉNO (cf. UÉNO, 1983 a).

Trechiama (s. str.) ***tenuis*** S. UÉNO, 1983

Trechiama (s. str.) *tenuis* S. UÉNO, 1983, Annot. zool. japon., **56**, p. 353, figs. 1–2; type locality: Mitsu-ga-maru in Shirotori-chô; 1985, Coleopt. Japan Col., Osaka, **2**, p. 74.

No additional record.

Range. Known so far only from the eastern part of the Sanuki Hills near the north-eastern end of the Island of Shikoku.

Trechiama (s. str.) ***fujitai*** S. UÉNO, 1969

Trechiama (s. str.) *fujitai* S. UÉNO, 1969, Bull. natn. Sci. Mus., Tokyo, **12**, p. 779, fig. 1; type locality: Ruri-dera in Nankô-chô; 1985, Coleopt. Japan Col., Osaka, **2**, p. 73. —— CASALE & LANEYRIE, 1982, Mém. Biospéol., **9**, p. 86.

Additional specimens examined. 1♂, 1♀, Ruri-dera on Funakoshi-yama, 300 m alt., Nankô-chô, Hyôgo Pref., 31–V–1975, H. ISHIDA leg. (NSMT).

Range. Known so far only from the type locality, which lies on the Chûgoku Hills in western Honshu.

Notes. This and the four following species form a compact complex within the group of *T. oni* because of the close similarity in the basic structure of male genitalia. The similarity is above all pronounced in the robust aedeagus with broad flattened apical lobe, in the absence of differentiated copulatory piece, and in the small cluster of heavily sclerotized teeth at the left side of inner sac. I have tentatively placed in the same complex the two species following these five, *T. hiurai* and *T. yukikoae*, but they may belong to different lineages, as will be noted under the headings of the respective species.

Trechiama (s. str.) ***moritai*** S. UÉNO, sp. nov.

(Figs. 1–2)

Length: 5.45–5.60 mm (from apical margin of clypeus to apices of elytra).

Closely allied to the preceding species, but distinguished from it by the lighter colour, wider pronotal apex and somewhat longer elytra with much shallower striae. Decisively different from *T. fujitai* in the shape of aedeagal apical lobe.

Colour light reddish brown, shiny; appendages more or less lighter than body. Head as in *T. fujitai*; antennae reaching apical four-ninths of elytra. Pronotum less contracted in front and with somewhat sharper hind angles, but otherwise similar to that of *T. fujitai*; PW/HW 1.36 in the holotype, 1.42 in the paratype, PW/PL 1.10 in the holotype, 1.15 in the paratype, PW/PA 1.40 in the holotype, 1.38 in the paratype, PW/PB 1.45 in the holotype, 1.44 in the paratype, PB/PA 0.97 in the holotype, 0.96 in the paratype. Elytra ovate, with relatively wide basal area, widest at about middle, and more regularly narrowed towards apices than towards bases; EW/PW 1.79 in the holotype, 1.77 in the paratype, EL/EW 1.53 in the holotype, 1.49 in the paratype; shoulders very obtuse though more apparent than in *T. fujitai*; sides feebly arcuate at middle, the curvature being evidently weaker than in *T. fujitai*; apices rather widely rounded; surface convex though depressed on the disc in basal two-thirds, apical declivity obviously steeper than in *T. fujitai*; striae much shallower than in *T. fujitai*, 4–5 disappearing in basal area, 6 faint and also disappearing in basal area, 7 barely perceptible at middle or obsolete, 8 impressed only behind the middle set of marginal umbilicate pores. Other external features as in *T. fujitai*.

Male genitalia basically similar to those of *T. fujitai*, though rather lightly sclerotized. Aedeagus about three-tenths as long as elytra, with broad apical lobe which is only feebly narrowed apicad and subtruncated at the extremity in dorsal view; viewed laterally, apical lobe evenly tapered towards pointed extremity, which is slightly turned up and devoid of subtriangular tooth at the left side. Inner sac devoid of left apical patch of spinules, but prospective formation of lamellar copulatory piece is indicated by a curved row of poorly sclerotized scales. Styles as in *T. fujitai*, each bearing three or four setae at apex.

Female unknown.

Type series. Holotype: ♂, paratype: 1♂ (somewhat teneral), 13–IX–1981, S. MORITA leg. Both deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Wakasugi-tôgé, 1,000 m alt., in Nishiawakura-mura, at the easternmost of Okayama Prefecture, western Honshu, West Japan.

Notes. Because of the close similarity in facies and basic structure of male genitalia, this new species is doubtless closely related to *T. fujitai*, though the difference in the modification of aedeagal apical lobe is striking between the two. Their localities are also close to each other and lie on the same range of hills, that of *T. moritai* being about 16.5 km distant to the north-northwest from that of *T. fujitai*.

The Wakasugi-tôgé, the type locality of *T. moritai*, is a pass at a height of 1,070 m on the borders between Okayama and Tottori Prefectures. The southwestern (Okayama) side of the pass is a gentle slope, on which lies the headspring of the Yoshino-gawa River. The two known specimens of the present species were found near the headspring, at the side of a small gully shaded by bamboo underbrushes, from under a heap of dead leaves and twigs. However, this cannot be considered a natural habitat of the trechine beetle, since no other specimen has been obtained by anyone under the similar condition in spite of repeated collectings. In slightly lower places in the same valley, there occurs another species of the *oni* group to be described on later pages of this paper under the name of *T. yukikoae*, which is typically upper hypogean. *Trechiama moritai* may also be upper hypogean in nature, though its natural habitat cannot be readily detected because of entangled roots of bamboos thickly covering the surface layer of the forest floor.

This new species is dedicated to Mr. Seiji MORITA, who is the only collector to have encountered it.

Trechiama (s. str.) *spinulifer* S. Uéno, sp. nov.

(Figs. 3–4)

Length: 5.05–6.10 mm (from apical margin of clypeus to apices of elytra).

Closely related to *T. moritai*, but readily distinguished from that species by the different shape of prothorax and elytra. Also distinguished from the latter by the presence of file-like structure on the ventral surface of aedeagal apical lobe.

Colour reddish brown, obviously darker than in *T. moritai*, shiny, with appendages more or less lighter. Head as in *T. fujitai*; antennae reaching apical three-sevenths of elytra. Pronotum elongate-subcordate, widest at about two-thirds from base, and equally narrowed in front and behind, with long basal part dilated posteriorly; PW/HW 1.35–1.40 (M 1.37), PW/PL 1.01–1.04 (M 1.02), PW/PA 1.38–1.44 (M 1.42), PW/PB 1.26–1.35 (M 1.31); sides gently arcuate in front, deeply sinuate at about basal fourth, and then divergent towards hind angles, which are acute and postero-laterally produced; apex distinctly narrower than base, PB/PA 1.08–1.10 (M 1.09), with front angles small and obtuse but more sharply marked than in *T. fujitai* and *T. moritai*. Elytra larger in ♂ than in ♀, ovate, widest at about four-ninths from base, and more pointed at apices than at bases; EW/PW 1.82–1.94 (M 1.88) [1.89–1.94 in ♂, 1.82–1.85 in ♀], EL/EW 1.45–1.48 (M 1.47); shoulders almost effaced, though the prehumeral borders are not particularly oblique; sides gently arcuate at middle, less so behind, and narrowly rounded at apices; surface convex, but the apical declivity is not so steep as in *T. moritai*; striation as in *T. fujitai* and much more clearly impressed than in *T. moritai*. Other external features as in *T. fujitai*.

Male genitalia heavily sclerotized, basically similar to those of *T. moritai* but markedly differing in the conformation of aedeagal apical lobe. Aedeagus about three-tenths as long as elytra, more robust than in *T. moritai*, higher and broader at middle, and rapidly flattened towards apex; apical lobe broad and thick, somewhat spoon-shaped, being covered on the ventral surface with numerous recurved spinules; viewed dorsally, apical lobe broad to near apex, which is subtruncated with lightly produced central portion; viewed laterally, apical lobe slightly reflexed towards the blunt extremity; basal part relatively elongate. Inner armature similar to that of *T. fujitai*; left apical patch of spinules moderately differentiated, consisting of compact, moderately sclerotized ones. Left style much larger than the right, each bearing three or four setae at apex.

Type series. Holotype: ♂, 11–VIII–1979, Y. Nishikawa leg. Allotype: ♀, 11–VIII–1979, A. Noto leg. Paratypes: 2♂♂, 3♀♀ (incl. teneral 1♂, 2♀♀), 11–VIII–1979, Y. Nishikawa & A. Noto leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Abandoned adit of Kinshô Mine, at Nakasé of Sekinomiya-chô, in Hyôgo Prefecture, western Honshu, West Japan.

Notes. This is a species showing sexual dimorphism in the size of hind body. Though considerably differing in facies, above all in the proportion of fore to hind bodies as well as in the shape of prothorax and elytra, it must be closely allied to *T. moritai* in view of the very similar conformation of male genitalia. However, *T. spinulifer* is unique in having a file-like structure on the ventral surface of aedeagal apical lobe, which has not been found in any other species of *Trechiama,* nor in any species of the whole Trechinae so far as I am aware.

This new species has been known only from an abandoned adit of a gold mine lying on the left side of the Yagi-gawa, a tributaiy of the Maruyama-gawa River. It is about 24.5 km distant to the east-northeast from the Wakasugi-tôgé, the type locality of both *T. moritai* and *T. yukikoae*, about 24.3 km distant to the north-northwest from Kawakami-kô Mine, that of *T. crassilobatus,* and about 270 m above sea-level. The accessible part of the adit is very short, having been blocked by a collapse at a depth of 8 m or so. Four of the seven known specimens of the trechine beetle were dug out from a heap of rock debris accumulated just inside the entrance, while the remaining three were found from under rotten mine posts lying on the brim of a shaft near the innermost of the accessible part.

Trechiama (s. str.) ***cuspidatus*** S. Uéno, sp. nov.

(Figs. 5–6)

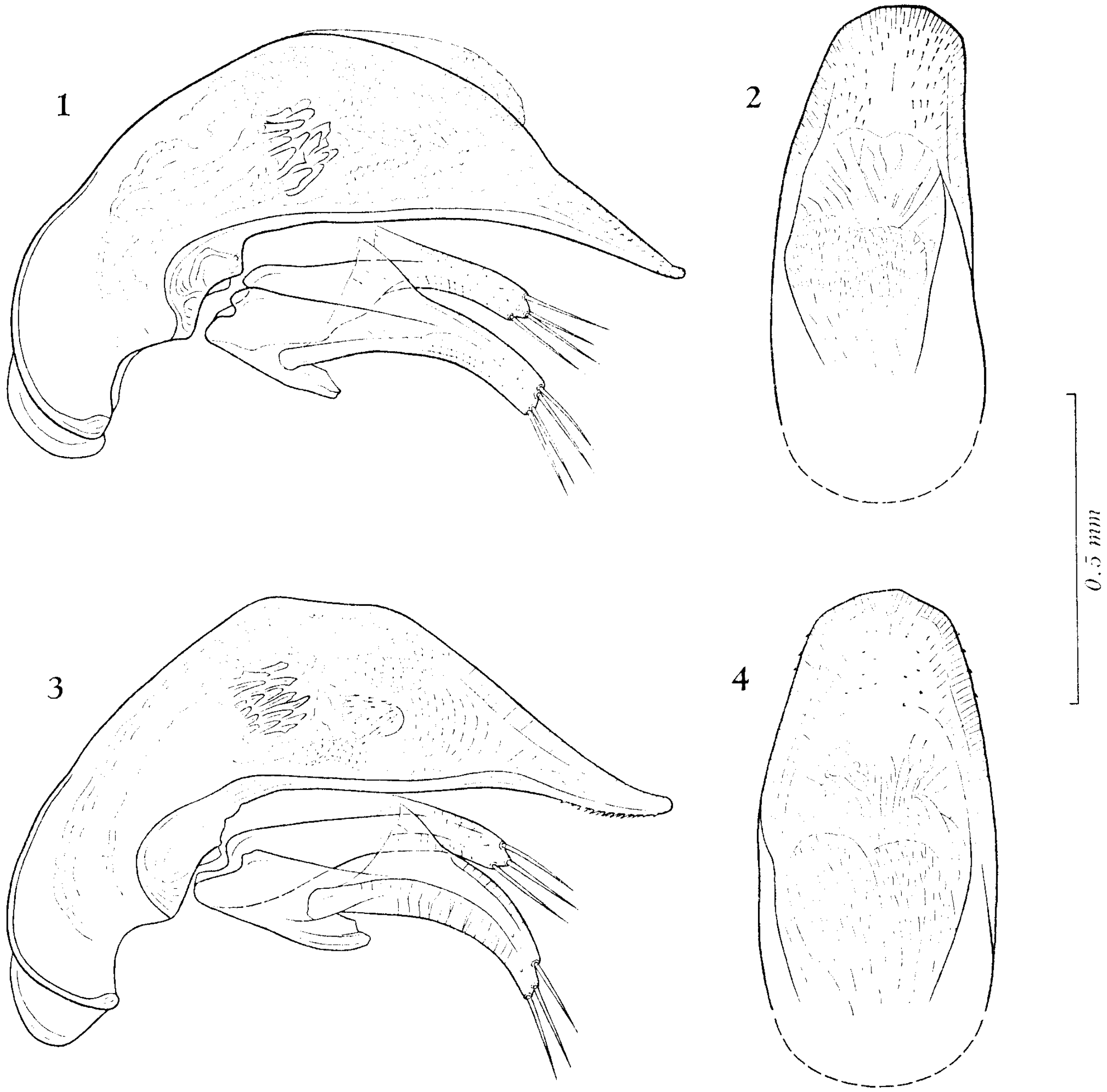
Length: 5.05–5.80 mm (from apical margin of clypeus to apices of elytra).

Externally very similar to *T. spinulifer* and barely distinguished from it by somewhat shorter prothorax and relatively small hind body, but strikingly different from all the known members of the species-complex in the conformation of aedeagal apical lobe.

Colour as in *T. spinulifer,* though the iridescence is usually a little stronger on elytra. Head as in *T. spinulifer*; antennae usually a little shorter in ♀ than in ♂. Pronotum a little shorter than in *T. spinulifer* but otherwise identical; PW/HW 1.40–1.48 (M 1.43), PW/PL 1.04–1.12 (M 1.07), PW/PA 1.40–1.52 (M 1.45), PW/PB 1.26–1.40 (M 1.33), PB/PA 1.04–1.13 (M 1.10). Elytra smaller, especially in ♀, and more convex than those in *T. spinulifer,* with the sides more regularly arcuate behind middle, but similar to the latter in other details; EW/PW 1.72–1.92 (M 1.83) [1.80–1.92, M 1.87, in ♂; 1.72–1.76, M 1.75, in ♀], EL/EW 1.42–1.50 (M 1.45).

Male genital organ similar in basic structure to that of *T. crassilobatus,* though less heavily sclerotized. Aedeagus about three-tenths as long as elytra, robust and dorsally convex as in *T. crassilobatus,* with the ventro-lateral parts outwardly expanded behind middle and forming a very broad apical lobe, which is strongly rounded at the sides towards the tip in dorsal view; ventro-lateral edges and ventral mid-line of apical lobe sharply carinate, the former carinae curving round inwards before the extremity and meeting with the median one at an angulate protuberance; viewed laterally, apical lobe thick even at the extremity and more or less curved ventrad; basal part elongate, moderately bent towards the ventral side, and deeply emarginate at the sides of basal orifice; sagittal aileron large though hyaline. Inner armature as in *T. crassilobatus*; no differentiated copulatory piece, though a poorly sclerotized lamella with rounded apex exists at the right apical side of left lateral teeth-patch. Styles fairly slender, each bearing four or five setae at apex.

Type series. Holotype: ♂, allotype: ♀, 23–VII–1980, Y. Nishikawa leg. Paratypes: 1♂, 28–X–1979, A. Noto & Y. Tarumi leg.; 13♂♂, 8♀♀ (incl. teneral 3♂♂, 3♀♀), 23–VII–



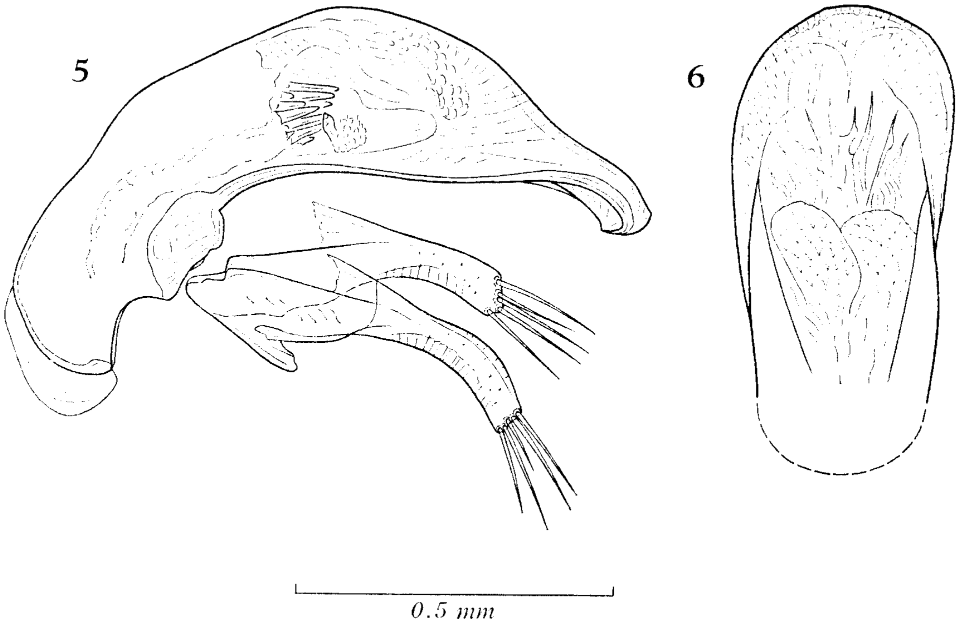
Figs. 1–4. Male genitalia of *Trechiama* spp.; left lateral view (1, 3), and apical part of aedeagus, dorso-apical view (2, 4). —— 1–2. *T.* (s. str.) *moritai* S. UÉNO, sp. nov., from the Wakasugi-tôgé. —— 3–4. *T.* (s. str.) *spinulifer* S. UÉNO, sp. nov., from Kinshô Mine.

1980, Y. NISHIKAWA & K. MUTÔ leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Abandoned adit of Machioku Mine, at Okuyama of Takinoya, in Yabu-chô, Hyôgo Prefecture, western Honshu, West Japan.

Notes. Though unique in the conformation of aedeagal apical lobe, this new species seems to be a close relative of *T. spinulifer.* This conclusion can be drawn from the fact that it is almost identical with the latter species in external morphology, though there are slight differences between the two in the shape of prothorax and elytra. Its locality is also nearer to that of *T. spinulifer* than to those of the other species.

The abandoned adit of Machioku Mine lies on the left side of the Okuyama-gawa at an altitude of about 420 m. The stream is a small branch of the Takinoya-gawa, a tributary



Figs. 5–6. Male genitalia of *Trechiama* (s. str.) *cuspidatus* S. Uéno, sp. nov., from Machioku Mine; left lateral view (5), and apical part of aedeagus, dorso-apical view (6).

of the Maruyama-gawa River that empties into the Japan Sea. It is about 14.2 km distant to the east-southeast from the type locality of *T. spinulifer* and 17.7 km distant to the north-northeast from that of *T. crassilobatus*. The accessible part of the adit is not long, having been blocked by a collapse after the stoppage of mining operation in 1944. However, the trechine beetle was found from near the entrance to the innermost, mostly from under rock debris accumulated in wet places.

Trechiama **(s. str.)** ***crassilobatus*** **S. Uéno, 1977**

Trechiama (s. str.) *crassilobatus* S. Uéno, 1977, Bull. natn. Sci. Mus., Tokyo, (A), **3**, p. 157, figs. 1–3; type locality: Kawakami-kô Mine in Ôkawachi-chô; 1985, Coleopt. Japan Col., Osaka, **2**, p. 73, pl. 14, fig. 8. —— Casale & Laneyrie, 1982, Mém. Biospéol., **9**, p. 87.

Additional specimens examined. 1♂, 2♀♀, Mt. Seppiko-san, 400 m alt., Yumesaki-chô, Hyôgo Pref., 6–VI–1982, Y. Nishikawa leg.; 17♂♂, 12♀♀ (incl. teneral 2♂♂, 2♀♀), same locality, 400–650 m alt., 12∼13–VII–1982, Y. Nishikawa leg.; 2♂♂, 5♀♀ (incl. 2 teneral ♀♀), Sugô-gawa Valley, 250 m alt., Kobata, Yumesaki-chô, Hyôgo Pref., 13∼14–VII–1982, Y. Nishikawa leg. (all NSMT).

Range. Distributed to the southeastern hills of the Bantan Highlands at the eastern part of the Chûgoku Hills in western Honshu.

Notes. The two new localities of *T. crassilobatus* recorded above lie on the same range of hills as the type locality, Mt. Seppiko-san being about 11 km south-southwest of Kawakami-kô Mine and the Sugô-gawa Valley 6.1–6.5 km south by west of the collecting sites on the southeastern slope of Mt. Seppiko-san. All the specimens were dug out from colluvia emplaced at the sides of shaded streams. These southern specimens are slightly different from the type series in that the aedeagal apical lobe is somewhat thinner and slightly turned up at the extremity. However, it seems useless recognizing an infraspecific taxon for them, since the difference is by no means decisive.

Trechiama (s. str.) ***hiurai*** S. UÉNO, sp. nov.

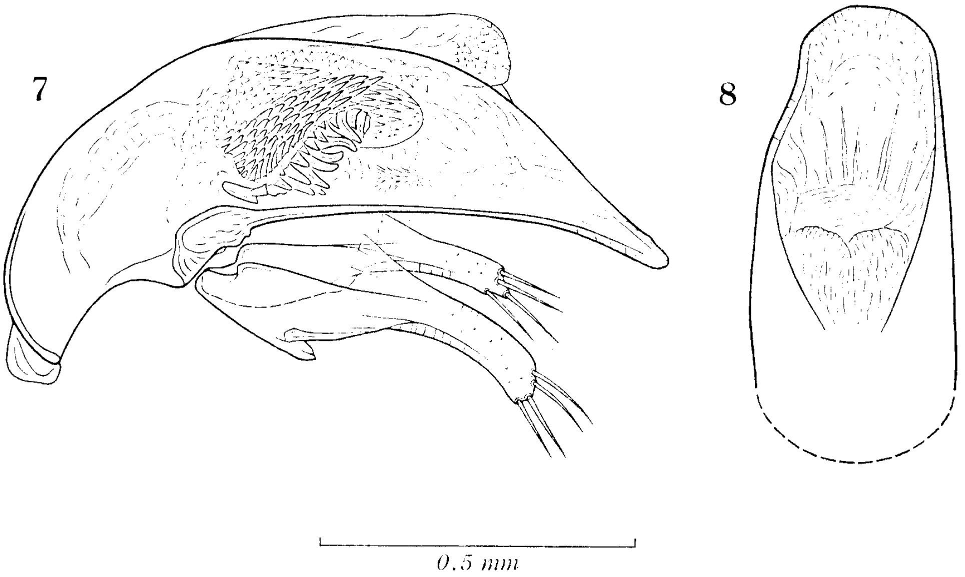
(Figs. 7–8)

Length: 4.75–5.60 mm (from apical margin of clypeus to apices of elytra).

Externally similar to *T. crassilobatus,* but smaller on an average and distinguished from the latter by the larger fore body, shorter prothorax with shorter basal part, and ovate elytra with ampler basal area and more apparent shoulders. Greatly different from *T. crassilobatus* and the other members of the *fujitai* complex in the configuration of aedeagus and the structure of inner armature.

Colour as in *T. crassilobatus.* Head slightly wider than in *T. crassilobatus,* with genae usually less convex; antennae somewhat shorter, usually reaching the middle of elytra. Pronotum shorter on an average than that of *T. crassilobatus,* mainly due to shorter basal part, with hind angles usually a little less protrudent; PW/HW 1.38–1.50 (M 1.44), PW/PL 1.11–1.17 (M 1.13), PW/PA 1.40–1.50 (M 1.47), PW/PB 1.38–1.46 (M 1.42), PB/PA 1.00–1.08 (M 1.04). Elytra a little smaller on an average and less convex than in *T. crassilobatus,* with ampler basal part, more apparent shoulders, less oblique prehumeral borders and more feebly arcuate sides; EW/PW 1.63–1.74 (M 1.69), EL/EW 1.40–1.53 (M 1.48). Legs somewhat shorter than in *T. crassilobatus.* Other external features as in *T. crassilobatus.*

Male genitalia rather lightly sclerotized, though fairly large and robust. Aedeagus about one-third as long as elytra, thick, somewhat depressed, and slightly arcuate, with the



Figs. 7–8. Male genitalia of *Trechiama* (s. str.) *hiurai* S. UÉNO, sp. nov., from Akioka Mine; left lateral view (7), and apical part of aedeagus, dorso-apical view (8).

dorsal margin semicircularly rounded in profile; basal part voluminous, gently curved ventrad, and widely emarginate at the sides of basal orifice; sagittal aileron present, though always small and hyaline; viewed laterally, apical part rapidly narrowed towards the blunt extremity; viewed dorsally, apical lobe broad and subparallel-sided to near apex, which is widely rounded and somewhat truncated at the central portion; ventral margin slightly emarginate at middle in profile. Inner sac armed with a large, sigmoidally folded teeth-patch at middle, a small group of minute spines just ventro-posterior to the large teeth-patch, and a small dorsal patch of poorly sclerotized scales near apical orifice; left ventro-lateral part of the large teeth-patch is formed by a series of large, heavily sclerotized teeth, while the main part consists of smaller compact teeth, which become fused together towards apex and form a semi-oval lamella transparent at the ventral portion. Styles fairly large, left style much larger than the right, each bearing four short setae at apex.

Type series. Holotype: ♂, 5–V–1977, Y. NISHIKAWA leg. Allotype: ♀, 11–VIII–1979, Y. NISHIKAWA leg. Paratypes: 8♂♂, 1♀ (incl. 1 teneral ♂), 5–V–1977, Y. NISHIKAWA, K. KATSURA & I. HIURA leg.; 2♂♂, 11–VIII–1979, Y. NISHIKAWA leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Abandoned adit of Akioka Mine, at Ojiro-dani on the northwestern side of Mt. Hyônosen, in Mikata-chô, Hyôgo Prefecture, western Honshu, West Japan.

Notes. This new species shares all the basic external features with the other members of the *fujitai* complex, but is decisively different from them in regard to the conformation of male genitalia. Its large robust aedeagus with voluminous basal part is quite dissimilar to those of the others, in which the basal part is always elongate and distinctly curved ventrad. Its styles bear unusually short setae at the apices. Most striking is the presence in its inner sac of a large intricate teeth-patch bearing an imperfect copulatory piece at the apex. This feature alone may be worth recognition of a complex of its own for *T. hiurai*. However, I prefer to regard the species as a peculiar offshoot of the *fujitai* complex, at least for the time being, since it cannot be distinguished by external characteristics and since its aedeagal apical lobe shows the same type of modification as those in the other members of the species-complex.

This interesting species has so far been known only from one of the abandoned adits of Akioka Mine lying in the Ojiro-dani Valley on the northwestern side of Mt. Hyônosen. This valley is formed by the upper stream of the Yada-gawa River that empties into the Japan Sea. The adit that harbours *T. hiurai* is the uppermost one on the left side of the valley at an elevation of about 620 m. It is about 18.3 km distant to the north-northeast from the Wakasugi-tôgé, the type locality of both *T. moritai* and *T. yukikoae*, and about 12.4 km distant to the west by north from Kinshô Mine, that of *T. spinulifer*. It is not long but has four branches, and maintains an environment favourable for subterranean animals. The trechine beetle was mostly found near the entrance, from under rotten mine posts and rock debris.

The present species is dedicated to the late Mr. Isamu HIURA, former chief curator of zoology at the Osaka Museum of Natural History, who always showed deep interest in my study of Trechinae and collected for me one of the paratypes of this trechine.

Trechiama (s. str.) ***yukikoae*** S. Uéno, sp. nov.

(Figs. 9–11)

Length: 5.60–6.05 mm (from apical margin of clypeus to apices of elytra).

Recognized at first sight on the peculiarly elongate form of body with short prothorax and narrow elytra. Also unique in the conformation of male genitalia.

Colour reddish brown, shiny, faintly iridescent on elytra, which are sometimes lighter in coloration; palpi, scape and apical segments of antennae, ventral surface of hind body, and legs usually somewhat lighter than body.

Head subquadrate, a little wider than long, and depressed above, with deep entire frontal furrows rather widely divergent in front and behind; frons and supraorbital areas gently convex; microsculpture fine though sharply impressed, consisting of transverse meshes and lines; remnants of eyes distinct though completely flat, about a half as long as genae, which are moderately convex and glabrous; neck fairly wide, with the anterior constriction rather deep and sharply marked at the sides; labrum transverse, shallowly emarginate at apex; mandibles fairly long, sharply hooked at apices; mentum tooth broad, deeply cleft at the tip; palpi thin; antennae slender though not particularly long, reaching the middle of elytra in ♂, usually a little shorter than that in ♀, segment 2 about five-ninths as long as segment 3, which is the longest and slightly longer than segment 4, segments 8–10 each about seven-ninths as long as segment 4 and about three times as long as wide, terminal segment longer than segment 10 or scape.

Pronotum subcordate, obviously wider than head, wider than long, widest at about two-thirds from base, and more rapidly contracted towards apex than towards base; PW/HW 1.36–1.44 (M 1.40), PW/PL 1.16–1.20 (M 1.18), PW/PA 1.49–1.55 (M 1.52), PW/PB 1.46–1.55 (M 1.50); surface moderately convex, with vague transverse striations; microsculpture formed by fine transverse lines, though partially degenerated; sides sharply and rather widely reflexed throughout, strongly arcuate in front, less so behind middle, rather shallowly but distinctly sinuate at a level between basal seventh and sixth, and then either subparallel or slightly divergent towards hind angles, which are either rectangular or a little sharp, hardly protrudent laterad; postangular setae absent; apex almost straight at middle, about as wide as base, PB/PA 0.97–1.05 (M 1.02); front angles obtuse, narrowly rounded, and only slightly produced; base either straight or slightly emarginate at middle, more or less arcuate on each side near hind angle; median line distinct, widening and deepening in basal area; apical transverse impression indistinct, somewhat uneven; basal transverse impression deep, continuous, foveolate on each side of median line, and laterally merging into basal foveae, which are not large but deep and smooth at the bottom; postangular carinae usually distinct though not long; basal area narrow and smooth, though longitudinally strigose along the basal margin.

Elytra oblong-ovate, widest at about or a little before middle, and a little more weakly narrowed towards bases than towards apices; EW/PW 1.57–1.62 (M 1.60), EL/EW 1.52–1.61 (M 1.57); surface convex though widely depressed on the disc, with steep apical declivity; microsculpture degenerated though consisting of fine transverse lines; shoulders distinct, with prehumeral borders either straight or slightly arcuate and only gently oblique; sides

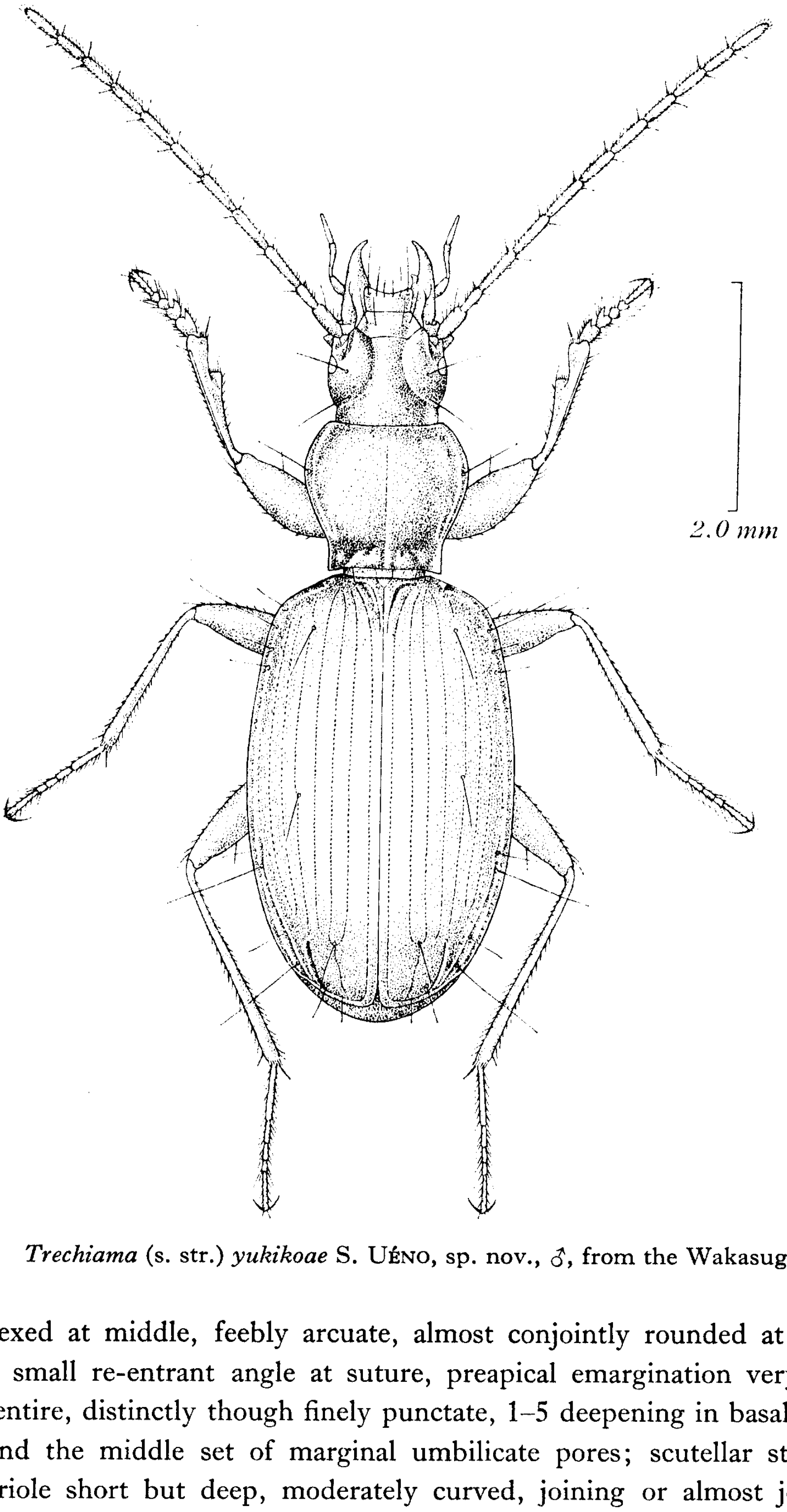


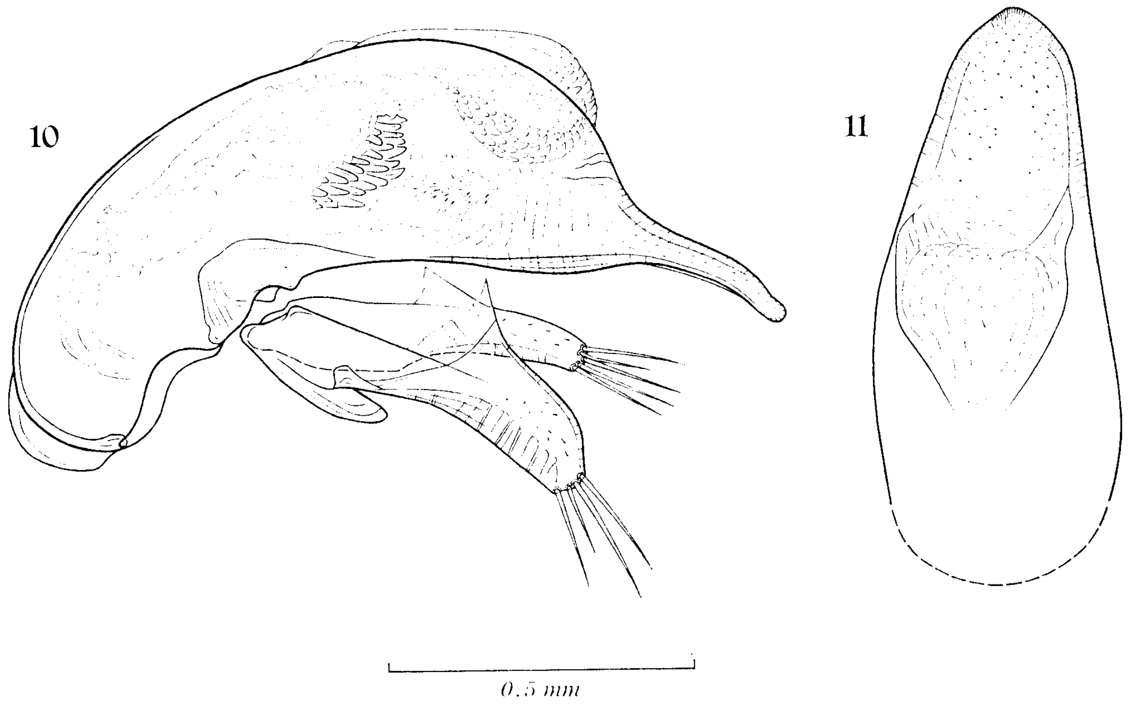
Fig. 9. *Trechiama* (s. str.) *yukikoae* S. Uéno, sp. nov., ♂, from the Wakasugi-tôgé.

moderately reflexed at middle, feebly arcuate, almost conjointly rounded at apices though forming a very small re-entrant angle at suture, preapical emargination very slight; striae superficial but entire, distinctly though finely punctate, 1–5 deepening in basal area, 8 deeply impressed behind the middle set of marginal umbilicate pores; scutellar striole long and deep; apical striole short but deep, moderately curved, joining or almost joining stria 5; intervals smooth, completely flat even near suture; apical carina distinct though obtuse; no setiferous dorsal pore on stria 3; preapical pore situated at the apical anastomosis of striae 2 and 3, and a little more distant from apex than from suture; stria 5 with two setiferous dorsal pores at basal 1/9–1/8 and about middle; in one of the paratypes, a third pore present on right elytron at apical three-sevenths; marginal umbilicate pores aggregated and regular.

Ventral surface smooth; anal sternite with a pair of sexual setae in ♂, two pair of them in ♀. Legs long but stout; protibiae straight, moderately dilated towards apices, longitudinally grooved on the external face, and glabrous on the anterior face even at the apical portion; in ♂, two proximal segments of each protarsus moderately dilated and stoutly dentate inwards at apices.

Male genital organ fairly large and heavily sclerotized, greatly differing from those of the other species of the *fujitai* complex in both the shape of aedeagus and the disposition of inner armature. Aedeagus large and robust, about one-third as long as elytra, with large elongate basal part and long flattened apical lobe; basal part moderately curved ventrad, with rather small basal orifice, whose sides are deeply emarginate; sagittal aileron narrow and hyaline; viewed laterally, apical part abruptly narrowed into a narrow, ventrally curved apical lobe, whose tip is blunt and slightly turned up; viewed dorsally, apical lobe broad at the base, gradually narrowed apicad, and ending in a subtriangular terminal portion; ventral margin distinctly convex behind middle in lateral view. Inner sac armed with two differentiated patches of sclerotized teeth but devoid of copulatory piece; left proximal teeth-patch formed by large, heavily sclerotized teeth, being elongate and oblique as a whole; dorso-apical teeth-patch much larger than the left proximal, though consisting of smaller and rather lightly sclerotized teeth; a fairly large patch of poorly sclerotized spinules present at the left side posterior to left proximal teeth-patch. Left style large and very broad, much larger than the right, each bearing four or five setae at apex.

Type series. Holotype: ♂, 13–IX–1981, S. Morita leg. Allotype: ♀, 22–VI–1981, A.



Figs. 10–11. Male genitalia of *Trechiama* (s. str.) *yukikoae* S. Uéno, sp. nov., from the Wakasugi-tôgé; left lateral view (10), and apical part of aedeagus, dorso-apical view (11).

Noto leg. Paratypes: 1♂, 7–VI–1975, K. Mori leg.; 1♀, 20–VII–1980, H. Ishida leg.; 1♂, 2♀♀, 22–VI–1981, A. Noto leg.; 1♂, 13–IX–1981, S. Morita leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Wakasugi-tôgé, 990–1,050 m alt., in Nishiawakura-mura, at the easternmost of Okayama Prefecture, western Honshu, West Japan.

Notes. This is an isolated species and, though tentatively placed in the *fujitai* complex, may form a lineage of its own. Its facies is unique in that the prothorax is short, that the hind body is narrow and rather parallel-sided instead of being broad and ovate or oval, and that the legs are relatively stout. Its male genital organ is also peculiar both in the configuration of aedeagus and in the disposition of teeth-patches. On the other hand, its affinity is no doubt close to the *fujitai* complex, since it shares with the latter such diagnostic characters as the loss of the postangular pair of marginal setae on pronotum, the anteriorly lying proximal dorsal pore on the fifth elytral stria, the broad flattened aedeagal apical lobe not tuberculate at the extremity, and the absence of differentiated copulatory piece inside the inner sac. In my present opinion, it had better be regarded as an offshoot of the *fujitai* complex, at least for the time being.

Trechiama yukikoae has so far been found only in the beech forest at the southwestern side of the Wakasugi-tôgé. It is presumably upper hypogean in nature, since four individuals were dug out by Noto at the same time from a colluvium thickly accumulated at the side of a small branch gully. Other specimens were taken from beneath large stones embedded in the soil, but their occurrence was always sporadical.

This remarkable new species is named to the memory of my mother, Yukiko, who passed away on January 14, 1985, at the age of 75, after having watched my cave explorations for long with both affection and apprehension.

Trechiama (s. str.) ***oni*** S. Uéno, 1955

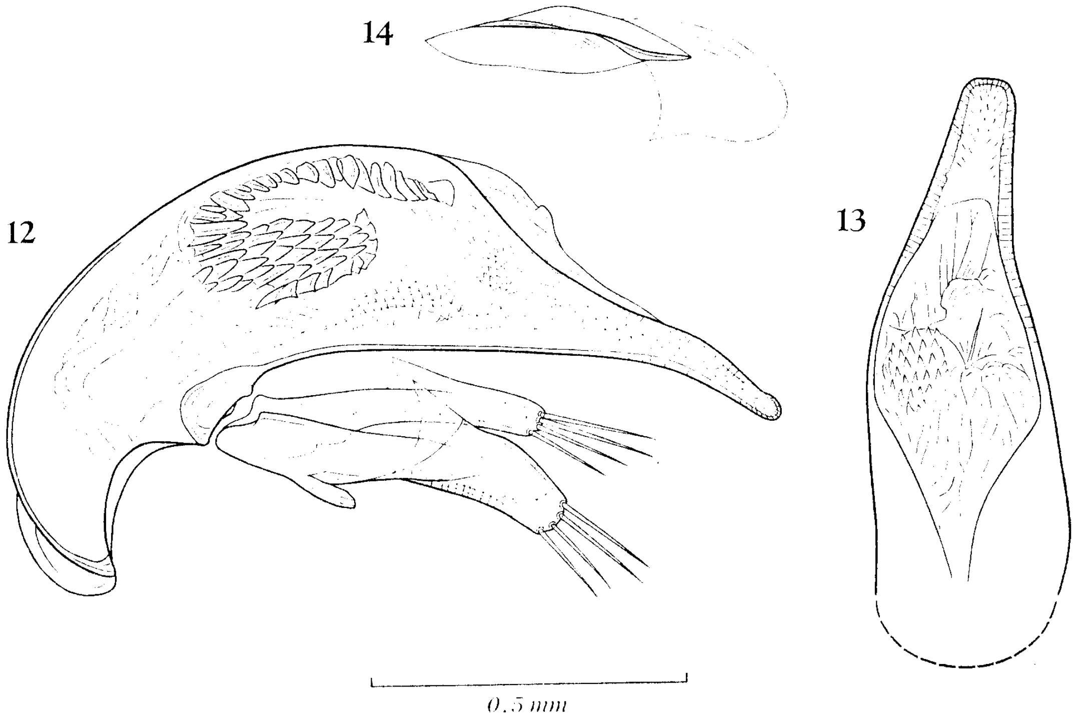
(Figs. 12–14)

Trechiama (*Pseudotrechiama*) *oni* S. Uéno, 1955, Mem. Coll. Sci. Univ. Kyoto, (B), **22**, p. 30, figs. 1–2; type locality: Oni-no-ana Cave at Kôjiro in Katsuyama-chô.
Trechiama (s. str.) *oni*: Uéno, 1959, Mem. Coll. Sci. Univ. Kyoto, (B), **26**, p. 31; 1985, Coleopt. Japan Col., Osaka, 2, p. 73.—— Casale & Laneyrie, 1982, Mém. Biospéol., **9**, p. 87.
Pseudotrechiama (s. str.) *oni*: Jeannel, 1962, Rev. fr. Ent., **29**, p. 196.

Length: 5.40–6.05 mm (from apical margin of clypeus to apices of elytra).

Relatively dark species of slender facies, readily recognized on the following combination of morphological features: head subquadrate, about as wide as long, with slightly convex genae and very shallow neck constriction; antennae relatively long, reaching apical two-fifths of elytra; pronotum elongated cordate and well convex, evidently wider than head, as wide as or only slightly wider than long, widest at about three-fifths from base, and equally narrowed in front and behind, with short basal part dilated posteriorly; pronotal sides widely arcuate in front, deeply sinuate at about one-seventh from base in most individuals, and then divergent towards sharp hind angles, which are protrudent postero-laterad; postangular setae absent; pronotal apex only very slightly narrower than base; elytra oblong-oval and convex, widest at about or a little before middle, and equally narrowed towards bases and towards apices, with effaced shoulders and moderately arcuate sides; striae entire though shallow, faintly crenulate, scutellar striole fairly long and deep, apical striole deep, joining or almost joining stria 5; no setiferous dorsal pore on stria 3; preapical pore rather widely distant from apex, though lying at about the level of the terminus of apical striole; stria 5 with two setiferous dorsal pores, of which the anterior one is rather widely distant from base, lying around basal 1/6 at about the level of the third umbilicate pore of the marginal series; legs long and slender. Standard ratios are: PW/HW 1.36–1.46 (M 1.42), PW/PL 1.00–1.07 (M 1.04), PW/PA 1.46–1.53 (M 1.50), PW/PB 1.44–1.52 (M 1.46), PB/PA 1.02–1.05 (M 1.04), EW/PW 1.62–1.70 (M 1.66), EL/EW 1.55–1.64 (M 1.59).

Male genitalia relatively large and heavily sclerotized. Aedeagus nearly one-third as long as elytra, somewhat compressed and not arcuate at middle, with the dorsal margin semicircularly rounded in profile in proximal two-thirds; basal part large and rather strongly curved ventrad, with large basal orifice, whose sides are widely and deeply emarginate; sagittal aileron narrow and hyaline; apical orifice large, with the sides widely, though shallowly, emarginate in profile; viewed laterally, apical lobe narrow, more or less distinctly curved ventrad, and slightly turned up at the blunt extremity; viewed dorsally, apical lobe long and narrow, inclined to the left, very gradually narrowed towards apex, which is narrowly subtruncated; ventral margin straight at middle in profile. Inner sac armed with well developed teeth-patches and a copulatory piece; left proximal teeth-patch very large, consisting of large, heavily sclerotized teeth, with a long horizontal dorsal arm branching off from the



Figs. 12–14. Male genitalia of *Trechiama* (s. str.) *oni* S. UÉNO, from Oni-no-ana Cave at Kôjiro; left lateral view (12), apical part of aedeagus, dorso-apical view (13), and separated copulatory piece, left lateral view (14).

dorso-proximal corner of the main part and consisting of a row of large teeth; left apical teeth-patch also well differentiated, consisting of small teeth and elongate scales, and divided into two portions, ventro-proximal and dorso-apical; right dorsal teeth-patch small, lying just inside apical orifice; copulatory piece wholly concealed by the left teeth-patches, consisting of a heavily sclerotized, horizontally stretched sclerite with narrow hyaline wings on either side and a very thin, completely transparent, round lamella at apex. Left style large and broad, much larger than the right, each bearing four setae at apex.

Additional specimens examined. 2♂♂, 2♀♀ (one of which is designated herewith as the allotype), Oni-no-ana Cave, Kôjiro, Katsuyama-chô, Okayama Pref., 3–V–1980, A. NOTO, Y. TARUMI & S. WAKANO leg. (NSMT).

Range. So far known with certainty only from the limestone cave called Oni-no-ana at Kôjiro on the Chûgoku Hills in western Honshu. Also recorded from the limestone cave called Kanba-no-oni-no-ana, which is about 3.1 km distant to the east-northeast from the type locality (UÉNO, 1959, p. 31), but the identity of this population should be confirmed by examination of male genitalia.

Notes. This is also an isolated species recognized at first sight on its facies alone. It seems to have a direct relationship to the *fujitai* complex, but is decisively different from the members of the latter in the presence of a large copulatory piece, the unique configuration of left proximal teeth-patch, and the long narrow apical lobe of aedeagus. The presence of the copulatory piece was overlooked when the species was originally described. As the sclerite is largely hyaline and wholly concealed by teeth-patches, its existence can be ascertained only when the inner sac is taken out from the aedeagal tube and carefully extended. A species-complex of its own is herewith recognized for *T. oni*, though the taxonomic gap between this and the *fujitai* complexes may be bridged if certain intermediate species are found in the intervening area between their distributional ranges now known.

The type locality of *T. oni* is a limestone cave lying on the left side of the Shinjô-gawa, a tributary of the Asahi-gawa River that empties into the Inland Sea of Seto-naikai. It is about 69.5 km distant to the west by south from the Wakasugi-tôgé, the type locality of both *T. moritai* and *T. yukikoae*, and about 70.5 km distant to the west from Ruri-dera on Funakoshi-yama, that of *T. fujitai*. We have endeavoured to obtain some subterranean trechine beetles in this wide intervening area, but have so far been unable to find any, as the area is largely granitic and not favourable for the habitat of such specialized insects.

Trechiama (s. str.) ***tangonis*** S. UÉNO, sp. nov.

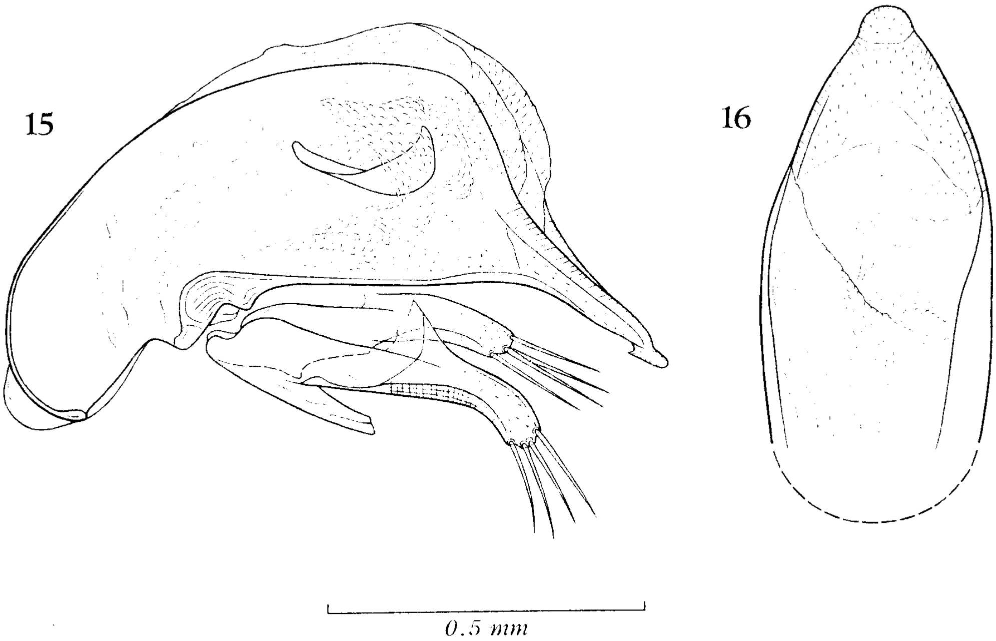
(Figs. 15–16)

Length: 5.50–6.05 mm (from apical margin of clypeus to apices of elytra).

Similar to the female of *T. notoi* in general appearance, but closer to *T. shuten* in the shape of prothorax. From the former, it is distinguished by the prothorax, which is more strongly contracted both at the apex and at the base, and more strongly rounded at the sides; from the latter, it can be discriminated by more regularly convex genae and more elongate and more convex elytra with steeper apical declivity. Readily discriminated from the two species by the different conformation of male genitalia.

Colour light reddish brown, shiny, faintly iridescent on elytra, lighter than in *T. notoi* but usually darker than in *T. shuten*; palpi, scape and apical segments of antennae, ventral surface of hind body, and legs yellowish brown. Head as in *T. notoi*; antennae usually reaching apical three-sevenths of elytra though variable to some extent in length. Pronotum similar to that in *T. shuten*, but usually a little more transverse, more strongly contracted towards apex, and steeper and more convex at the lateral parts; sides more strongly rounded in front, less deeply sinuate at about basal fifth, and then either subparallel or gently divergent towards hind angles, which are usually less sharp and less protrudent than in *T. shuten*; post-angular setae present; in one of the paratypes, an extra marginal seta present on the left side in front of the ordinary anterior one; front angles more obtuse and hardly produced; PW/HW 1.39–1.49 (M 1.43), PW/PL 1.08–1.17 (M 1.12), PW/PA 1.48–1.56 (M 1.51), PW/PB 1.36–1.51 (M 1.44), PB/PA 1.00–1.11 (M 1.05). Elytra very similar to those in the female of *T. notoi*, though narrower on an average and more clearly punctate in the striae; EW/PW 1.62–1.78 (M 1.71), EL/EW 1.54–1.62 (M 1.57). Legs as in *T. shuten* and somewhat slenderer than in *T. notoi*.

Male genitalia small though rather heavily sclerotized, greatly differing from those of *T. shuten* and all the other members of the *kosugei* complex in the absence of left proximal patch of large teeth. Aedeagus short and robust, only two-sevenths as long as elytra, not arcuate at middle, and only gently asymmetrical at apical orifice, with rather narrow basal part and broad flattened apical lobe, the latter of which is produced ventro-caudad and forms a rounded horizontal plate at the tip, whose anterior margin is sharply carinate; viewed laterally, apical lobe narrow, abruptly bent ventrad at the apical portion, and dilated into the apical plate, of which the posterior end is blunt but the anterior end is acute; viewed dorsal-



Figs. 15–16. Male genitalia of *Trechiama* (s. str.) *tangonis* S. Uéno, sp. nov., from the Misaka-dani Valley on Gongen-yama; left lateral view (15), and apical part of aedeagus, dorso-apical view (16).

ly, apical lobe very broad at the base and rapidly narrowed towards apex, which is produced into a broad semicircular protuberance; basal orifice fairly large, with the sides deeply but briefly emarginate only at the posterior parts; sagittal aileron very small and transparent; in profile, ventral margin almost straight at middle but distinctly emarginate at the base of apical lobe. Inner sac scaly, armed with a copulatory piece but devoid of the left proximal patch of large teeth; copulatory piece partially enveloped by poorly sclerotized scale-sheet, narrow at the proximal part, dilated and twisted towards apex, and ending in an obtuse tip directed dorsally; right dorsal teeth-patch fan-shaped, consisting of small compact teeth. Styles fairly broad, each provided with four or five, rather long setae at apex.

Type series. Holotype: ♂, allotype: ♀, 2–X–1984, S. Uéno leg. Paratypes: 18♂♂, 7♀♀, 2–X–1984, S. Uéno & Y. Nishikawa leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Misaka-dani, 200 m alt., on Gongen-yama, at Sodeshi of Tango-chô, near the northern tip of the Yosa Peninsula, in Kyoto Prefecture, western Honshu, West Japan.

Notes. This new species shows the same type of peculiar modification of aedeagal apical lobe as *T. notoi*, but the relationship between them does not seem direct. Its aedeagus is not very asymmetrical at the apical orifice, and the inner armature is not much differentiated at the left side, both the features being indicative of the relative primitiveness of the species. On the contrary, *T. notoi* must be the most derivative constituent of the same lineage, as is readily known from the very peculiar modification of its male genitalia. Besides, the known localities of the two species are geographically remote, and the intervening area between them is occupied at least by four different species of the same lineage at various stages of differentiation (cf. Fig. 20).

The present species has been known only from a gully on Gongen-yama near the north-eastern end of the Tango Hills on the Yosa Peninsula (also called the Tango Peninsula). It is about 31 km distant to the north-northeast from the type locality of *T. shuten* and about 41 km distant to the north-northwest from that of *T. kosugei*. The spot at which the trechine beetle was found is a small branch on the left side of the Misaka-dani Valley running down the northern slope of the hill. A talus was formed under a dried cascade in the gully shaded by deciduous broadleaved trees and was fed by seepages. All the known specimens were dug out from this talus, usually from a depth of 50 cm or so but sometimes from deeper spots. They were very agile when exposed. We made searches for the trechine beetle throughout the Tango Hills, but failed in finding out any other habitat probably due to pedologically unfavourable condition of rocks and soil.

This and the seven following species belong to the same lineage, which will be called the *kosugei* complex. They are rather diverse in the modification of male genitalia, but have peculiarly asymmetrical apical orifice in common. This peculiarity is not pronounced in *T. tangonis* and *T. shuten*, which may be the most primitive within the species-complex.

Trechiama (s. str.) ***shuten*** S. Uéno, 1978

Trechiama (s. str.) *shuten* S. Uéno, 1978, Bull. natn. Sci. Mus., Tokyo, (A), 4, p. 294, figs. 1–4; type locality: Oni-no-iwaya Cave on Mt. Ôé-yama; 1985, Coleopt. Japan Col., Osaka, 2, p. 73, pl. 14, fig. 6. —— Casale & Laneyrie, 1982, Mém. Biospéol., 9, p. 86.

No additional record.

Range. Known so far only from the type locality on Mt. Ôé-yama of the Seitan Hills at the northern side of western Honshu.

Notes. Like that of the preceding species, the aedeagal apical orifice is not very asymmetrical in *T. shuten*, but the mode of differentiation of male genitalia is considerably different between them. This species may be closer to *T. yoshiakii* than to *T. tangonis,* though the difference between the former two is still considerable.

Trechiama (s. str.) ***silicicola*** S. Uéno, 1981

Trechiama (s. str.) *silicicola* S. Uéno, 1981, Bull. natn. Sci. Mus., Tokyo, (A), 7, p. 79, figs. 1–4; type locality: Otogawachi Mine in Ichijima-chô; 1985, Coleopt. Japan Col., Osaka, 2, p. 73. —— Casale & Laneyrie, 1982, Mém. Biospéol., 9, p. 86.

No additional record.

Range. So far known only from a silicastone mine lying to the south of Fukuchiyama City in western Honshu.

Notes. This species is very peculiar in the loss of postangular setae on pronotum and the oval elytra with effaced shoulders, but is closely allied to *T. kosugei* beyond all doubt, as is clearly shown by the close similarity of male genitalia. In fact, their aedeagi are almost identical with each other, with the exception of a definite discrepancy in the differentiation of copulatory piece.

Trechiama (s. str.) ***kosugei*** S. Uéno, 1955

(Figs. 17–19)

Trechiama (*Pseudotrechiama*) *kosugei* S. Uéno, 1955, Mem. Coll. Sci. Univ. Kyoto, (B), 22, p. 33, fig. 3; type locality: Magura.

Trechiama (s. str.) *kosugei*: Uéno, 1959, Mem. Coll. Sci. Univ. Kyoto, (B), 26, pp. 30, 31; 1985, Coleopt. Japan Col., Osaka, 2, p. 73. —— Casale & Laneyrie, 1982, Mém. Biospéol., 9, p. 86.

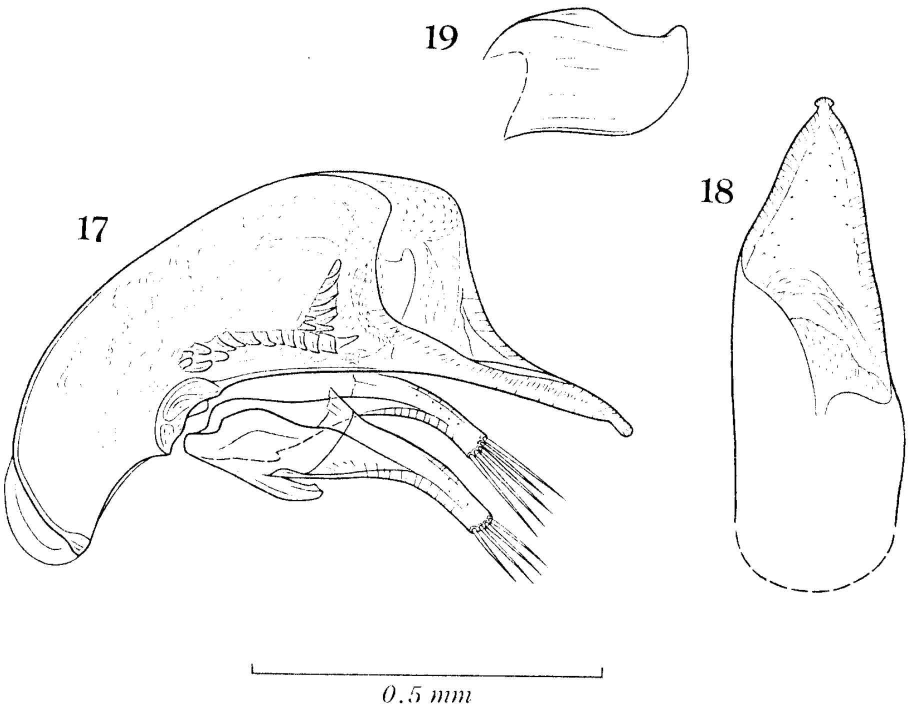
Pseudotrechiama (s. str.) *Kosugei*: Jeannel, 1962, Rev. fr. Ent., 29, pp. 196, 197.

Length: 5.10–5.50 mm (from apical margin of clypeus to apices of elytra).

Relatively small species of slender facies, having the following combination of external features: colour rather light reddish brown, with yellowish brown appendages; head subquadrate, about as wide as long, with only feebly convex genae and very shallow neck constriction; antennae relatively short, reaching or extending slightly beyond the middle of elytra; pronotum subcordate and convex, wider than head, a little wider than long, widest at about two-thirds from base, and more rapidly contracted in front than behind, with the sides rather strongly arcuate in front, less so behind middle, distinctly but not deeply sinuate at about basal fifth, and then either subparallel or slightly divergent towards hind angles, which are more or less sharp but hardly protrudent in most individuals; postangular setae present; pronotal apex about as wide as base, with front angles distinct though only slightly produced;

elytra oblong-oval and convex, widest a little before middle, and equally narrowed towards bases and towards apices, with rather feebly arcuate sides and rounded shoulders; striae superficial, faintly crenulate, outer ones becoming obsolete in basal area, scutellar striole fairly long and deep, apical striole deep, usually joining stria 7; no setiferous dorsal pore on stria 3; preapical pore relatively close to apex though more distant from apex than from suture; stria 5 with two setiferous dorsal pores at about basal fifth and a little behind middle; legs slender. Standard ratios are: PW/HW 1.36–1.41 (M 1.39), PW/PL 1.04–1.10 (M 1.07), PW/PA 1.43–1.47 (M 1.45), PW/PB 1.37–1.46 (M 1.42), PB/PA 1.00–1.05 (M 1.02), EW/PW 1.68–1.79 (M 1.72), EL/EW 1.56–1.64 (M 1.59).

Male genital organ small though moderately sclerotized, basically very similar to that of *T. silicicola* but differing from it in the presence of a well differentiated copulatory piece. Aedeagus only two-sevenths as long as elytra, very short, gently compressed, and dilated towards large apical orifice, with long flattened apical lobe peculiarly tuberculate at the tip; basal part small, curved ventrad, and widely but not deeply emarginate at the sides of basal orifice; sagittal aileron thin and transparent; apical orifice remarkably asymmetrical, with the left wall much reduced as compared with the right; viewed dorsally, apical lobe long subtriangular, with the terminal tubercle small, transverse and briefly pedunculate; viewed laterally, apical lobe narrowly produced, with the terminal tubercle ventrally curved; ventral margin only slightly emarginate at middle in profile. Inner sac partially scaly, being armed with a large copulatory piece and left proximal patch of large, heavily sclerotized teeth; copulatory piece about one-third as long as aedeagus, broad, thin, and partially enveloped by a



Figs. 17–19. Male genitalia of *Trechiama* (s. str.) *kosugei* S. Uéno, from the Hashidani Valley at Magura; left lateral view (17), apical part of aedeagus, dorso-apical view (18), and separated copulatory piece, left lateral view (19).

twisted sheet of poorly sclerotized scales, with the tip blunt and briefly produced upwards; teeth-patch elongate and bent behind middle, the longer proximal part being horizontal, while the shorter apical part extending dorso-apically; right apical patch of small scales present though only poorly sclerotized. Styles short, relatively narrow and arcuate, each bearing four or five setae.

Additional specimens examined. 1♂, 2♀♀, Hashi-dani Valley, 70 m alt., Magura, Maizuru-shi, Kyoto Pref., 1–X–1984, S. Uéno & Y. Nishikawa leg. (NSMT).

Range. Known only from the Hashi-dani Valley to the southwest of the village of Magura at the northern side of western Honshu.

Notes. The aedeagal inner armature of this species was not satisfactorily described in the original description. A detailed examination of the aedeagus of a freshly obtained topotypical male has revealed that the inner sac is armed with a large, though hyaline, copulatory piece and an elongate left proximal teeth-patch sharply bent behind middle. These details can be observed with certainty only when the inner sac is extracted and extended.

It is evident from what was written by Kosuge (1948, p. 181), who collected the type material, that the actual type locality of this species is the Hashi-dani Valley about 1 km southwest of the village of Magura. The three topotypical specimens recorded above were dug out from a very wet colluvium emplaced on the left bank of the valley. All of them were found on a bed rock beneath rock debris mingled with soil.

Trechiama (s. str.) ***expectatus*** S. Uéno, 1983

Trechiama (s. str.) *expectatus* S. Uéno, 1983, Annot. zool. japon., 56, p. 247, figs. 1–2; type locality: Takedao Mine in Nishinomiya-shi; 1985, Coleopt. Japan Col., Osaka, 2, p. 73, pl. 14, fig. 5.

No additional record.

Range. Hitherto known with certainty only from an abandoned mine adit in the Muko-gawa drainage at the southern side of Hyôgo Prefecture in western Honshu.

Trechiama (s. str.) ***dissitus*** S. Uéno, 1984

Trechiama (s. str.) *dissitus* S. Uéno, 1984, J. speleol. Soc. Japan, 9, p. 10, figs. 5–6; type locality: Inunaki-san.

No additional record.

Range. Known so far only from the type locality, which lies on the Izumi Hills at the western part of the Kii Peninsula.

Trechiama (s. str.) ***yoshiakii*** S. Uéno, 1978

Trechiama (s. str.) *yoshiakii* S. Uéno, 1978, Bull. natn. Sci. Mus., Tokyo, (A), 4, p. 298, figs. 5–8; type locality: Tengan Mine in Taki-chô; 1985, Coleopt. Japan Col., Osaka, 2, p. 73.——Casale & Laneyrie, 1982, Mém. Biospéol., 9, p. 86.

No additional record.

Range. Known from three silicastone mines lying at the southern side of the Taki

Hills near the western end of the Tanba Highlands in western Honshu.

Trechiama (s. str.) ***notoi*** S. Uéno, 1981

Trechiama (s. str.) *notoi* S. Uéno, 1981, Bull. natn. Sci. Mus., Tokyo, (A), 7, p. 82, figs. 5–7; type locality: Toyono Mine in Nosé-chô; 1985, Coleopt. Japan Col., Osaka, 2, p. 73, pl. 14, fig. 7. —— Casale & Laneyrie, 1982, Mém. Biospéol., 9, p. 86.

Additional specimens examined. 3♂♂, 1♀, Toyono Mine, Hino, Yamada, Nosé-chô, Osaka Pref., 3–IV–1984, Y. Nishikawa leg. (NSMT).

Range. Known only from an abandoned manganese mine lying at the southeastern edge of the Settan Hills in western Honshu.

Notes. The specimens recorded above were collected in the upper adit of Toyono Mine, while all the type specimens were taken in the lower adit. They are identical with the latter in every detail.

Trechiama (s. str.) ***insolitus*** S. Uéno, 1959

Trechiama (s. str.) *insolitus* S. Uéno, 1959, Mem. Coll. Sci. Univ. Kyoto, (B), 26, pp. 31, 32, figs. 1–2; type locality: Hakuun-dô Cave at Taishaku; 1985, Coleopt. Japan Col., Osaka, 2, p. 74, pl. 14, fig. 12. —— Casale & Laneyrie, 1982, Mém. Biospéol., 9, p. 87.

Pseudotrechiama (*Hemitrechiama*) *insolitus*: Jeannel, 1962, Rev. fr. Ent., 29, pp. 196, 197.

No additional record.

Range. Distributed to several limestone caves in the Taishaku area at the central part of the Chûgoku Hills in western Honshu.

Notes. This species is very peculiar in the chaetotaxy of elytra and is greatly different from all the other species belonging to the group of *T. oni*. It was placed by Jeannel (1962, *loc. cit.*) in its own subgenus, and though I cannot agree with him in recognizing *Hemitrechiama,* it belongs to an isolated lineage beyond all doubt. Its distributional range is also isolated from those of the other species-complexes; Hakuun-dô Cave, the type locality, is about 48 km distant to the southwest from Oni-no-ana Cave at Kôjiro, which harbours *T. oni* of the *oni* complex, and the wide intervening area between them is occupied by the members of the group of *T. yokoyamai* (cf. Fig. 20).

Discussion

As was delineated in the preceding chapter, the twenty-three known species of the group of *Trechiama oni* can be classified into six (possibly seven) complexes, that is, those of *instabilis, satoui, fujitai* (and possibly *yukikoae*), *oni, kosugei* and *insolitus*. Of these, the first two are no doubt closely related to each other; I have already explained its reasons under the heading of *T. murakamii* (pp. 168–169).

The following two are also related to each other, since they share the loss of postangular setae on pronotum and the symmetrical apical orifice of aedeagus. Though having advanced in a different manner, the *kosugei* complex seems to have been derived from a common ancestor with the *fujitai* complex. This can be inferred from the facts that the asymmetry of aedeagal apical orifice is not yet pronounced in *T. tangonis* and *T. shuten,* that the aedeagal apical lobe is usually broad and variously modified at the tip, and that at the western periphery of its distributional range, there occurs a species which is definitely very close to *T. kosugei* but approaches to the members of the *fujitai* complex both in the facies and in the loss of postangular setae on pronotum. Besides, sexual dimorphism in the size of hind body has been known only in these two complexes.

The affinity of the last one, the *insolitus* complex, is not certain. It cannot be directly related to the *fujitai–oni* assemblage because of the peculiarities in the chaetotaxy of elytra and the presence of postangular setae on pronotum. Its aedeagus is also different in conformation from those of any species of the eastern complexes. However, *T. insolitus* seems to have been derived from the ancestral stock of the group of *T. ohshimai* and to take part in the group of *T. oni*.

Thus, three major subgroups can be recognized in the species-group under consideration. They are mutually exclusive, and though certain species of a subgroup are sometimes very similar in external features to those of another, they are always decisively different in genitalic characteristics. Whether or not all the three are really descended from the same ancestor is difficult to determine. It is possible that the group of *T. oni* as treated in this paper may actually be a polyphyletic assemblage, and that the three subgroups may represent the descendants of three different ancestors in the group of *T. ohshimai*. If this were the case, the so-called diagnostic characters of the species-group might have been developed independently in respective subgroups. We cannot deny this possibility, since the two similar species-groups, those of *T. oni* and *T. habei*, are considered to have been formed by parallel evolution. For practical reasons, however, I prefer to regard all the three as the constituents of the group of *T. oni*, even if their similarity may have resulted from convergence.

The first subgroup is endemic to northeastern Shikoku and the Island of Awaji-shima. It is divided into two species-complexes, those of *T. instabilis* and *T. satoui*. In regard to external morphology, the former is evidently more primitive than the latter, as it still retains, if not in all the individuals, a setiferous dorsal pore on the third elytral stria. In genitalic structure, however, it is more derivative, because a copulatory piece has become differentiated. Within the latter complex, *T. fujiwaraorum* may be the most primitive so far as concerned with genitalic structure; the opposite is *T. tenuis*, in which the left proximal teeth-patch becomes differentiated and the aedeagal apical part is modified into a long narrow lobe.

This subgroup may be descended from an ancestor similar to *T. exilis* S. Uéno (1983 a, p. 70, figs. 1–3) of the *ohshimai* group. It may have invaded northeastern Shikoku from somewhere in the eastern part of the Chûgoku Hills and may have once been widespread in the eastern part of the island. After the differentiation of the new subgroup, direct descendants of the original immigrant may have receded to certain refuges, and only a few of them survive to the present at the northernmost and southernmost corners of eastern Shikoku. This hypothesis seems good to account for the relict existence of a few members of the *ohshimai* group in eastern Shikoku, but does not explain why the trechines belonging to the *instabilis* and *satoui* complexes are mostly restricted to the northern side of the Yoshino-gawa Valley, or the Median Tectonic Zone. As is shown in Fig. 20, the mountains at the southern side of the valley are inhabited by the members of the group of *T. chikaichii*, though representatives of these two groups meet in the Dôzan-gawa drainage area at the western end of their distributional ranges.

In all probability, the ancestral trechines of the *satoui* subgroup must have first colonized on the ancient Sanuki Hills and radiated from there. One of them (that of *T. onocoro*) spread eastwards onto the Island of Awaji-shima, the southern hills of which were then a part of the Sanukis. The differentiation between *T. satoui* and *T. tenuis* must have taken place very recently, no doubt in the Postglacial Period, since the two species are at the sibling stage of speciation. The occurrence of an isolated population of *T. satoui* on Iwaseo-yama Hill (No. 9 in Fig. 20) can be explained by fluvial dispersal of its ancestor (cf. UÉNO, 1983 a, pp. 75–76).

In spite of the possession of a differentiated copulatory piece, I consider the *instabilis* complex older than the *satoui* complex. This may be the reason why the existing forms of the former are much more localized than those of the latter. Of the two known species, *T. murakamii* has been recorded only from a small valley lying at the southeastern periphery of the distributional range of *T. fujiwaraorum* (No. 1 in Fig. 20), while *T. instabilis* is endemic to a small isolated hill at the southwestern end of the Sanuki Plain (No. 2 in Fig. 20).

The second subgroup is also enigmatic in the inconsistency of evolutionary grade between external and genitalic characters. In external morphology, the *kosugei* complex is no doubt more primitive than the others, since it is less modified in facies and mostly still retains the postangular pair of marginal setae on pronotum. On the contrary, its aedeagus becomes asymmetrical at the apical orifice and almost always bears a differentiated copulatory piece inside the inner sac, both the features indicative of an advanced state. Having become differentiated from the common ancestor of the subgroup, its evolution seems to have progressed in its own way as to yield such a remarkable species as *T. notoi* at the climax.

The eight known species of the *kosugei* complex are mostly distributed over the eastern part of the Chûgoku Hills, that is, along the eastern periphery of the distributional range of the group of *T. oni*, with the exception of *T. dissitus* which occurs on the Izumi Hills at the western part of the Kii Peninsula (cf. Fig. 20). This pattern of distribution, narrowly stretching from the coast of the Japan Sea in the north to the Izumi Hills in the south across the eastern parts of the Chûgoku Hills and the Inland Sea of Seto-naikai, is very peculiar and cannot be accounted for by topographical and/or paleogeographical reasons. It must have been formed by competition with the *ohshimai* complex of the group of *T. ohshimai*, whose dominant members seem to have invaded the eastern part of the past range of the *kosugei* complex and to have replaced its original inhabitants (cf. UÉNO, 1980, p. 268). This view is further reinforced by the fact that such derivative species of the *kosugei* complex as *T. yoshiakii* and *T. notoi* occur at the central part of its distributional range and that relatively primitive ones are localized in the peripheral areas (cf. UÉNO, 1983 b, p. 249; also refer to Fig. 20 of the present paper). Like the newcomers belonging to the *ohshimai* complex, these newly differentiated dominant species must also have replaced original inhabitants, dividing the range of relatively primitive forms into two parts, northern peripheral and southern peripheral.

The species occurring in the northern peripheral area pose intricate but interesting problems. Here again, inconsistency of evolutionary grade is found in certain important features. For instance, *T. tangonis* can be considered one of the most primitive species of the complex, because of the weak asymmetry of aedeagal apical orifice and the poor development of teeth-patches, but the apex of aedeagal apical lobe shows a remarkable modification comparable to that in *T. notoi*. In *T. shuten,* the aedeagal apical orifice is only weakly asymmetrical, but the inner armature becomes considerably differentiated and the apex of apical lobe shows a unique modification. Still more peculiar is *T. silicicola,* which is very similar to *T. kcsugei* in genitalic features but varies towards the *fujitai* complex in external morphology. Contrary to the striking modification of its aedeagus, the copulatory piece still remains imperfect in this species, a condition which is fairly common in the *fujitai* complex but is very exceptional in the *kosugei* complex. In short, the four species known in this area show four different types of modification. Each of them is restricted to a small isolated range of hills at the northeastern part of the Chûgokus, and this is probably why such a remarkable differentiation has taken place among them.

As compared with these northern forms, the species occurring in the southern peripheral areas are uniform, although there is a very wide geographical gap between the localities of the two known species, *T. expectatus* and *T. dissitus*. They must have become differentiated from the same ancestor in rather a recent period, and the latter species must have immigrated into the Izumis from somewhere in the southern part of the Tanba Highlands. As was already pointed out in its original description (Uéno, 1984, p. 12), it is difficult to decide at present by what means and route was made the southward dispersal of the ancestor of

---

Fig. 20. Map showing the distribution of subterranean trechine beetles belonging to the group of *Trechiama oni* and its adjacent species-groups. Localities of the species of the *oni* group are indicated by symbols with numerals; those of the other groups only by small symbols. ∇–*instabilis* complex; ▼–*satoui* complex; ●–*fujitai* complex; ◆–*oni* complex; ▲–*kosugei* complex; ■–*insolitus* complex. +–*ohshimai* group; ▲–*yokoyamai* group; ×–*chikaichii* group.—— 1, Gazatta-dani, incl. prospecting adit at Nakanokawa (*T. murakamii* S. Uéno, and *T. cornutus cornutus* S. Uéno of the *chikaichii* group); 2, Zôzu-san (*T. instabilis* S. Uéno); 3, prospecting adit and upper hypogean habitat at Nagano (*T. fujiwaraorum* S. Uéno); 4, Hinooku-kô Adit (*T. fujiwaraorum* S. Uéno); 5, Shingû Mine (*T. fujiwaraorum* S. Uéno); 6, Fujiwarasan-no-kanaudo Adit (*T. fujiwaraorum* S. Uéno); 7, Daisen-zan (*T. satoui* S. Uéno); 8, Ôyashiki and Besshi (*T. satoui* S. Uéno); 9, Iwaseo-yama (*T. satoui* S. Uéno, and *T. exilis* S. Uéno of the *ohshimai* group); 10, Mitsu-gamaru (*T. tenuis* S. Uéno); 11, Ayuya-gawa Valley on Kabuto-yama (*T. onocoro* S. Uéno); 12, Nariai-gawa Valley on Kabuto-yama (*T. onocoro* S. Uéno); 13, Ruri-dera on Funakoshi-yama (*T. fujitai* S. Uéno); 14, Wakasugi-tôgé (*T. moritai* sp. nov. and *T. yukikoae* sp. nov.); 15, Kinshô Mine (*T. spinulifer* sp. nov.); 16, Machioku Mine (*T. cuspidatus* sp. nov.); 17, Kawakami-kô Mine and prospecting adit at Hatagiri (*T. crassilobatus* S. Uéno); 18, Seppiko-san (*T. crassilobatus* S. Uéno); 19, Sugô-gawa Valley (*T. crassilobatus* S. Uéno); 20, Akioka Mine (*T. hiurai* sp. nov.); 21, Oni-no-ana Cave at Kôjiro (*T. oni* S. Uéno); 22, Kanba-no-oni-no-ana Cave (*T. oni* S. Uéno); 23, Gongen-yama (*T. tangonis* sp. nov.); 24, Oni-no-iwaya Cave on Ôé-yama (*T. shuten* S. Uéno); 25, Otogawachi Mine (*T. silicicola* S. Uéno); 26, Hashi-dani Valley at Magura (*T. kosugei* S. Uéno); 27, Tengan Mine and Shinden Mine (*T. yoshiakii* S. Uéno); 28, Tanba Mine (*T. yoshiakii* S. Uéno); 29, Toyono Mine (*T. notoi* S. Uéno); 30, Takedao Mine (*T. expectatus* S. Uéno); 31, Inunaki-san (*T. dissitus* S. Uéno); 32, Oni-no-iwaya Cave at Kami-taishaku (*T. insolitus* S. Uéno, and *T. yokoyamai yokoyamai* S. Uéno of the *yokoyamai* group); 33, Hakuun-dô Cave (*T. insolitus* S. Uéno); 34, Onjaku-dô Cave (*T. insolitus* S. Uéno); 35, Amagô-dô Cave (*T. insolitus* S. Uéno). The larger black triangle marked by the letter X indicates the locality of a new species of the *kosugei* complex discovered after the completion of the manuscript of this paper (see Postscript).

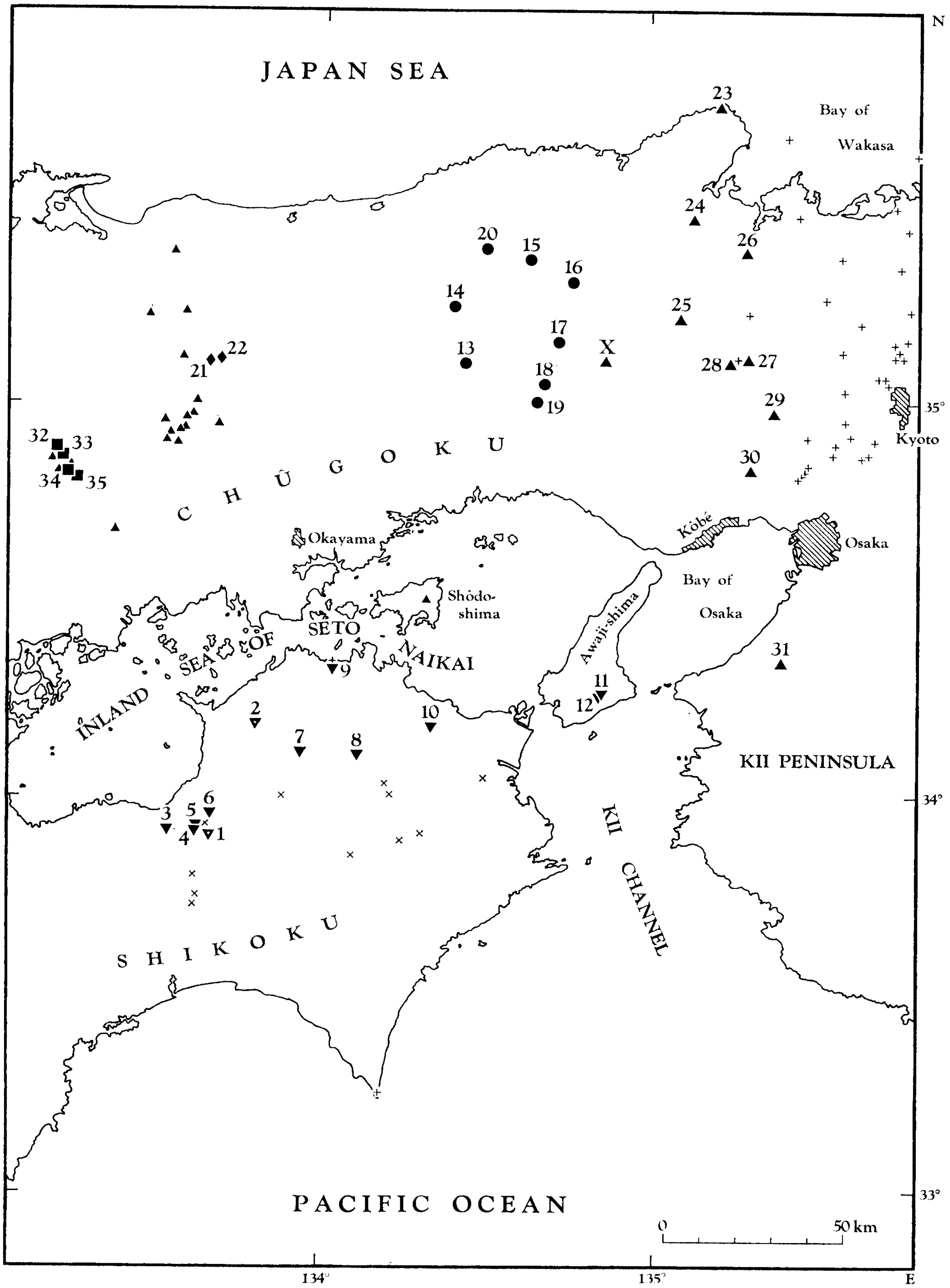

N
JAPAN SEA
23
Bay of
Wakasa
24
26
20
15
16
14
25
17
X
13
18
19
21
22
28
27
29
35°
32
33
34
35
Kyoto
C H Ū G O K U
30
Okayama
Kōbe
Osaka
Bay of
Osaka
Shōdo-
shima
INLAND SEA OF SETO NAIKAI
Awaji-shima
9
11
12
31
2
10
7
8
KII PENINSULA
34°
3
5
6
4
1
KII CHANNEL
S H I K O K U
PACIFIC OCEAN
33°
0
50 km
134°
135°
E

Fig. 20

T. dissitus, but I am rather inclined to consider that it was achieved across the Bay of Osaka through the agency of flood waters.

The second species-complex of the second subgroup, called the *fujitai* complex, is autochthonous to the Bantan Highlands of the Chûgoku Hills. Its distributional range is almost contiguous to that of the *kosugei* complex, though actual place of contact between them has not been known. Of the seven species tentatively placed in this complex, *T. fujitai, T. moritai, T. spinulifer, T. cuspidatus* and *T. crassilobatus* form a compact group and are doubtless descended from the same ancestor. With the exception of the last-named species, all are strictly localized in small valleys or mine adits, and exhibit striking differentiation in the conformation of aedeagal apical lobe without undergoing appreciable modification of other parts of male genitalia.

Trechiama hiurai, recorded from a mine adit lying at the northern periphery of the known range of the *fujitai* complex, is considerably different from the other members in the conformation of male genitalia, but it is similar to them in external morphology and occurs in the same general area of distribution of the species-complex. Its derivation may be clarified if other related species are discovered at the northern part of the Tajima area. The remaining one, *T. yukikoae,* is so widely isolated from the others in both the external and genitalic features that it may not belong to the *fujitai* complex. That the species coexists with *T. moritai* in the same small valley also suggests this possibility. However, it is no doubt closer to the *fujitai* complex than to any other complexes and can safely be regarded as a descendant of the same ancestor.

The last species of the second subgroup to be considered is *T. oni* localized in two limestone caves to the north of the Atetsu-Jôbô karstic area. It is discriminated in its own lineage because of the peculiarities in facies and aedeagal structure, but it seems to have a close affinity to the *fujitai* complex. As was already noted in the chapter on taxonomy (p. 183), there is a wide geographical gap between the known ranges of the *oni* and *fujitai* complexes (cf. Fig. 20). However, this does not necessarily mean that the geographical isolation of *T. oni* is sufficiently complete, since our investigation of the upper hypogean fauna is still inadequate in the intervening area about 70 km in length, even though it is largely unfavourable for the habitats of anophthalmic trechines. These small creatures can survive even in a granitic terrain, if there are small non-granitic gullies in which condition of soil and moisture is good for their existence. It is, therefore, most probable that certain gullies inhabited by subterranean trechines have so far escaped from our searches. It is to be hoped that habitats of certain new species will be located in the wide intervening area and that the discoveries will fill in the blank in our knowledge about the derivation of the *oni* complex.

The third subgroup comprises only one known species, *T. insolitus,* which has been recorded from four limestone caves in the Taishaku area at the central part of the Chûgoku Hills. *Trechiama yokoyamai yokoyamai* S. UÉNO (1958 a, p. 182, fig. 1; 1958 b, p. 187, fig. 4) of the group of *T. yokoyamai* also occurs in the same area, but the two species do not usually coexist in the same habitat. Only the known exception is Oni-no-iwaya Cave (No. 32 in Fig. 20), in which *T. insolitus* is found mingled with *T. y. yokoyamai.* The latter seems predominant over the former, which may have played an important role in forming the mosaic pattern of trechine distribution in that part of the Chûgoku Hills. By the same reason, the former species may have become isolated from the other members of the same species-group, seeing that the intervening area between the known localities of *T. oni* and the species under consideration is wholly occupied by *T. yokoyamai*. The isolation must have lasted for so long a time as to make the derivation of the species ambiguous.

Thus, the three subgroups of the group of *T. oni* seem to have different histories of dispersal and differentiation. Though it is difficult to determine which is the oldest, both the morphological features and the mode of distribution suggest that the *insolitus* subgroup has been separated from the others for a very long time. The differentiation between the other two seems to have taken place more recently, and the colonization of northeastern Shikoku by the ancestors of the *satoui* subgroup may have been effected across the Inland Sea of Seto-naikai. Subsequently, these immigrants became differentiated into two lineages now recognized as the *instabilis* and *satoui* complexes. At present, the latter is predominant over the former, whose constituents are localized in narrow limits. The remaining subgroup, whose members spread over the eastern part of the Chûgoku Hills, became differentiated into three or four lineages. The easternmost lineage, the *kosugei* complex , followed a unique evolutionary trend and, having been invaded from the east by dominant members of the group of *T. ohshimai*, formed a peculiar distributional range narrowly stretching in a north–south direction. The ancestors of the other lineages seem to have colonized first on the Bantan Highlands as the *fujitai* complex and then to have narrowly extended westwards, branching off smaller lineages there.

What should be done from now on is to find out links between the *kosugei* and *fujitai* complexes, possibly on the Sen-ga-miné Hills and/or the western part of the Seitan Hills, to search for some relatives of *T. hiurai* at the northernmost part of the Bantan Highlands, and above all, to fill in the blank between the distributional range of the *fujitai* complex and the known localities of *T. oni*. When these are realized, we shall be able to reconstruct the history of distribution and differentiation of the group of *T. oni* on a sounder basis.

Summary

The anophthalmic trechine beetles belonging to the group of *Trechiama oni* are enumerated. The twenty-three species hitherto known are classified into three subgroups, each of which is subdivided into two, three (or possibly four) and one species-complexes, respectively. They are: 1) *satoui* subgroup with *instabilis* complex (*T. murakamii* S. UÉNO and *T. instabilis* S. UÉNO) and *satoui* complex (*T. fujiwaraorum* S. UÉNO, *T. onocoro* S. UÉNO, *T. satoui* S. UÉNO and *T. tenuis* S. UÉNO), 2) *oni* subgroup with *fujitai* complex (*T. fujitai* S. UÉNO, *T. moritai* sp. nov., *T. spinulifer* sp. nov., *T. cuspidatus* sp. nov., *T. crassilobatus* S. UÉNO, *T. hiurai* sp. nov., and possibly *T. yukikoae* sp. nov.), *oni* complex (*T. oni* S. UÉNO), and *kosugei* complex (*T. tangonis* sp. nov., *T. shuten* S. UÉNO, *T. silicicola* S. UÉNO, *T. kosugei* S. UÉNO, *T. expectatus* S. UÉNO, *T. dissitus* S. UÉNO, *T. yoshiakii* S. UÉNO and *T. notoi* S. UÉNO), and 3) *insolitus* subgroup with only *insolitus* complex (*T. insolitus* S. UÉNO). A key is given to all these species, interrelationship between subgroups and species-complexes is discussed, and the distributional pattern of the species-group is shown. It is suggested that the three subgroups may have had independent origins in the ancestral stock of the group of *T. oh-*

shimai, but for practical taxonomic reasons, all are regarded as taking part in the group of *T. oni*.

要　　　約

オニメクラチビゴミムシ群 (group of *Trechiama oni*) の甲虫類は，主として中国山地の東部と四国北東部とに分布し，淡路島南部と和泉山脈にもそれぞれ1種が生息する．日本海岸から瀬戸内海の南側まで拡がっているので，この種の昆虫群としてはかなり例外的な分布域をもつことになる．本来は地下浅層にすむものらしいが，石灰洞など自然の洞窟や鉱山の廃坑からも見つかっている．既知種は17あり，新たに6種を追加記載した．これら23種のすべてを文献とともに列挙し，区別点を検索表で示すとともに，既知種のうちで原記載の不完全な2種の再記載も行った．

この種群は3亜群に大別され，そのうちのふたつはさらに2～3の系列に次のように区分される．

1）サトウメクラチビゴミムシ亜群
  a) ゾウズサンメクラチビゴミムシ系
    ムラカミメクラチビゴミムシ *T. murakamii* S. UÉNO, ゾウズサンメクラチビゴミムシ *T. instabilis* S. UÉNO
  b) サトウメクラチビゴミムシ系
    フジワラメクラチビゴミムシ *T. fujiwaraorum* S. UÉNO, オノコロメクラチビゴミムシ *T. onocoro* S. UÉNO, サトウメクラチビゴミムシ *T. satoui* S. UÉNO, シロトリメクラチビゴミムシ *T. tenuis* S. UÉNO
2）オニメクラチビゴミムシ亜群
  a) フジタメクラチビゴミムシ系
    フジタメクラチビゴミムシ *T. fujitai* S. UÉNO, ワカスギメクラチビゴミムシ *T. moritai* S. UÉNO, キンショウメクラチビゴミムシ *T. spinulifer* S. UÉNO, マチオクメクラチビゴミムシ *T. cuspidatus* S. UÉNO, トノミネメクラチビゴミムシ *T. crassilobatus* S. UÉNO, ヒウラメクラチビゴミムシ *T. hiurai* S. UÉNO, ユキコメクラチビゴミムシ *T. yukikoae* S. UÉNO（この種は別系列のものである可能性が強い）
  b) オニメクラチビゴミムシ系
    オニメクラチビゴミムシ *T. oni* S. UÉNO
  c) コスゲメクラチビゴミムシ系
    タンゴメクラチビゴミムシ *T. tangonis* S. UÉNO, シュテンメクラチビゴミムシ *T. shuten* S. UÉNO, イチジマメクラチビゴミムシ *T. silicicola* S. UÉNO, コスゲメクラチビゴミムシ *T. kosugei* S. UÉNO, ムコガワメクラチビゴミムシ *T. expectatus* S. UÉNO, イズミメクラチビゴミムシ *T. dissitus* S. UÉNO, テンガンメクラチビゴミムシ *T. yoshiakii* S. UÉNO, ノトメクラチビゴミムシ *T. notoi* S. UÉNO
3）タイシャクメクラチビゴミムシ亜群
  a) タイシャクメクラチビゴミムシ系
    タイシャクメクラチビゴミムシ *T. insolitus* S. UÉNO

これらのすべてが同一の祖先から分化したものかどうか，という点には多少問題があるが，いずれもヨシイメクラチビゴミムシ群 (group of *T. ohshimai*) のうちから派生したことは確かなので，ここでは単一の種群の亜群として取り扱った．

最初の亜群は，四国の北東部と淡路島南部とに分布し，吉野川本流の右岸には侵入していない．このことからみて，中国山地の東部から瀬戸内海を渡って四国へ移住した祖先型のチビゴミムシは，おそらく讃岐山脈を中心に分化したものと推察される．次の亜群は，主として中国山地の東部に分布し，東からコスゲメクラチビゴミムシ系，フジタメクラチビゴミムシ系，オニメクラチビゴミムシ系の順に拡がっている．系列間

の相互関係は複雑で，分化の過程を追跡するのも容易ではないが，少なくともオニメクラチビゴミムシが，2番めの系列のうちから分化したことは確かだろう．最後のタイシャクメクラチビゴミムシ亜群は，上翅の剛毛式がほかの亜群の場合と大きく異なり，分布の様子も遺存的なので，かなり古い時代から隔離されてきたものであるにちがいない．

この種群の甲虫類の調査はまだ不十分で，とくにオニメクラチビゴミムシ亜群に属する系列間の空隙を埋める地域の様子がよくわかっていない．将来，千ヶ峰山地，西丹山地西部，播但高原北部，津山盆地周辺の山地などからこの亜群のメクラチビゴミムシ類が発見されれば，系統関係も分布の過程も，より高い信頼性をもって解析できるようになるだろう．

Postscript

After the manuscript of this paper had been sent to the press, a new species of the *kosugei* complex was discovered in a gully on the western slope of Minami-yama of the Sen-ga-miné Hills. The discovery is very important, as the hill is geographically nearer to the hitherto known range of the *fujitai* complex than to that of the *kosugei* complex, being about 14.2 km east-southeast of the type locality of *T. crassilobatus* belonging to the former (No. 17 in Fig. 20) and about 24.5 km west-southwest of that of *T. silicicola* belonging to the latter (No. 25 in Fig. 20). It is, however, difficult to add its description to this paper, since to do so will affect the whole pagenation of the journal. For the present, I only indicate the new locality on the map showing the distribution of the group of *Trechiama oni* (X in Fig. 20 on p. 193). Its proper description will be given in a separate paper to be published in a forthcoming volume of the Journal of the Speleological Society of Japan.

References

Casale, A., & R. Laneyrie, 1982. Trechodinae et Trechinae du monde. Tableau des sous-familles, tribus, séries phylétiques, genres, et catalogue général des espèces. *Mém. Biospéol.*, **9**: i+1–226.

Jeannel, R., 1962. Les Trechini de l'Extrême-Orient. *Rev. fr. Ent.*, **29**: 171–207.

Kosuge, K., 1948. Konchû no Saishû. vi+5+6+214 pp. Kyoto, Tomi-shoten. (In Japanese.)

Uéno, S.-I., 1955. Studies on the Japanese Trechinae (IV) (Coleoptera, Harpalidae). *Mem. Coll. Sci. Univ. Kyoto*, (B), **22**: 29–34.

Uéno, S.-I., 1958a. The cave trechids from the central part of the Chûgoku District, Japan. I. A new species of *Trechiama* from the Taishaku limestone area. *Ibid.*, **25**: 181–184.

Uéno, S.-I., 1958b. Ditto. II. The geographical races of *Trechiama yokoyamai* S. Uéno. *Ibid.*, **25**: 185–197.

Uéno, S.-I., 1959. Ditto. III. The group of *Trechiama oni* S. Uéno. *Ibid.*, **26**: 29–36.

Uéno, S.-I., 1969. A new endogean *Trechiama* (Coleoptera, Trechinae) from western Honshu, Japan. *Bull. natn. Sci. Mus., Tokyo*, **12**: 779–782.

Uéno, S.-I., 1975. Two new *Trechiama* (Coleoptera, Trechinae) from eastern Shikoku, Japan. *Ibid.*, (A), **1**: 203–212.

Uéno, S.-I., 1977. A new anophthalmic *Trechiama* (Coleoptera, Trechinae) from copper mines in western Honshu, Japan. *Ibid.*, (A), **3**: 157–161.

Uéno, S.-I., 1978. Two new anophthalmic *Trechiama* (Coleoptera, Trechinae) found in non-calcareous areas of Central Japan. *Ibid.*, (A), **4**: 293–301.

Uéno, S.-I., 1979. New cave-dwelling trechine beetles from the eastern part of the Kii Peninsula, Central Japan. *Ibid.*, (A), **5**: 115–126.

Uéno, S.-I., 1980. The anophthalmic trechine beetles of the group of *Trechiama ohshimai*. *Ibid.*, (A), **6**: 195–274.

UÉNO, S.-I., 1981a. Two new anophthalmic *Trechiama* (Coleoptera, Trechinae) found in mine adits of Central Japan. *Bull. natn. Sci. Mus., Tokyo,* (A), **7**: 79–85.

UÉNO, S.-I., 1981b. New anophthalmic *Trechiama* (Coleoptera, Trechinae) from northern Shikoku, Japan. *J. speleol. Soc. Japan,* **6**: 11–18.

UÉNO, S.-I., 1981c. *Trechiama tamaensis* (Coleoptera, Trechinae) and its close relatives. *Mem. natn. Sci. Mus., Tokyo,* (14): 117–132.

UÉNO, S.-I., 1982. Occurrence of *Trechiama fujiwaraorum* (Coleoptera, Trechinae) in the upper hypogean zone. *J. speleol. Soc. Japan,* **7**: 100.

UÉNO, S.-I., 1983a. The anophthalmic trechine beetles from Takamatsu, Southwest Japan. *Bull. natn. Sci. Mus., Tokyo,* (A), **9**: 69–77.

UÉNO, S.-I., 1983b. A new *Trechiama* (Coleoptera, Trechinae) rediscovered after thirty-seven years. *Annot. zool. japon.,* **56**: 246–250.

UÉNO, S.-I., 1983c. The faunal affinity of the Island of Awaji-shima as viewed from trechine beetles. *Ibid.,* **56**: 351–357.

UÉNO, S.-I., 1983d. New anophthalmic *Trechiama* (Coleoptera, Trechinae) from the upper hypogean zone of Northeast Japan. *J. speleol. Soc. Japan,* **8**: 7–17.

UÉNO, S.-I., 1984. Two new species and a new record of the group of *Trechiama oni* (Coleoptera, Trechinae). *Ibid.,* **9**: 5–13.

UÉNO, S.-I., 1985. Carabidae (Nebriinae, Elaphrinae, Loricerinae, Scaritinae, Broscinae, Trechinae). *In* UÉNO, S.-I., Y. KUROSAWA & M. SATÔ (eds.), *The Coleoptera of Japan in Color,* **2**: 54–88. Osaka, Hoikusha. (In Japanese.)